

AD-751 900

LASER COMMUNICATION SYSTEMS

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Alexandria, Virginia

November 1972

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AD-751 900

LASER COMMUNICATION SYSTEMS

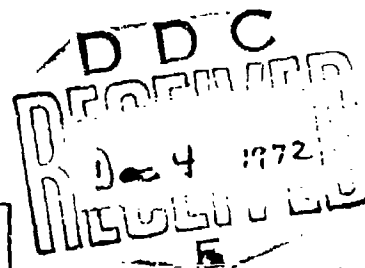
A DDC BIBLIOGRAPHY

DDC-TAS-72-53

NOVEMBER 1972

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U						

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LASER COMMUNICATION SYSTEMS

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August 1961 - January 1972

DDC-TAS-72-53

NOVEMBER 1972

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DEFENSE SUPPLY AGENCY
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ALEXANDRIA, VIRGINIA 22314**

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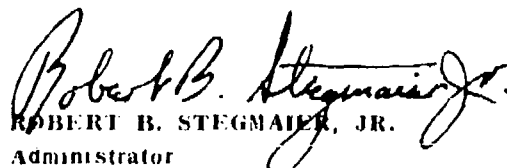
This bibliography is a selection of references to unclassified and unlimited reports in the Defense Documentation Center's collection on *laser Communication Systems*. Entries were selected from references processed into the AD data bank from January 1953 through March 1972.

Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract, and Report Number indexes are included.

This bibliography supersedes Report Number DDC-TAS-70-56 dated August 1970, AD-710 460.

BY ORDER OF THE DIRECTOR, DEFENSE SUPPLY AGENCY

OFFICIAL


ROBERT B. STEGMAIER, JR.
Administrator
Defense Documentation Center

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PERSONAL AUTHOR.....	P-1
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REPORT NUMBER.....	R-1

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /7LW13

AD-264 455

STANFORD UNIV CALIF STANFORD ELECTRONICS LABS

DIRECT OBSERVATION OF MICROWAVE-FREQUENCY BEATS DUE
TO PHOTOMIXING OF RUBY-OPTICAL-MASER MODES (U)

1V MCMURTRY, B.J.; SIEGMAN, A.E.

CONTRACT: DA36 039SC85387

MONITOR: AFOSR 1350

UNCLASSIFIED REPORT

DESCRIPTORS: *MASERS, *MICROWAVES, *PHOTOTURES, *RUBY,
DESIGN, LASERS, MEASUREMENT, OPTICAL EQUIPMENT, OXIDE
CATHODES, RADIO RECEIVERS, TRAVELING WAVE TUBES (U)

OBSERVATIONS WERE MADE OF MICROWAVE SIGNALS
PRODUCED BY PHOTOMIXING OF NEAR-NEIGHBOR AXIALMODE
COMPONENTS IN THE OUTPUT SPECTRUM OF A RUBY OPTICAL
MASER (LASER). THE OBSERVATIONS WERE MADE BY
FOCUSING THE LASER OUTPUT ONTO THE OXIDE CATHODE OF
AN OPERATING 2500-4000 MC TRAVELINGWAVE TUBE.
MIXING (HETERODYNING) BETWEEN THE SIMULTANEOUS,
DISCRETE OPTICAL FREQUENCIES IN THE LASER OUTPUT
OCCURS IN THE TWT CATHODE, PRODUCING MICROWAVE
AMPLITUDE MODULATION OF THE BEAM CURRENT. THIS
AMPLITUDE MODULATION IS AMPLIFIED IN THE HELIX
SECTION, PRODUCING EASILY OBSERVABLE MICROWAVE
SIGNALS IN THE TWT OUTPUT. WITHIN THE TWT
BANDWIDTH, DISCRETE SIGNALS WERE OBSERVED AT 1800
PLUS OR MINUS 20, 2410 PLUS OR MINUS 3, 3000 PLUS OR
MINUS 20, AND 3600 PLUS OR MINUS 20 MC,
REPRESENTING THE 'PHOTO-BEATS' BETWEEN THIRD- THROUGH
SIXTH-NEAREST NEIGHBORS IN THE LASER-MODE SPECTRUM.
THIS METHOD OF OBSERVATION IS A POWERFUL TOOL FOR
STUDY OF OPTICAL MASERS, AND ALSO HAS SIGNIFICANT
IMPLICATIONS FOR COMMUNICATIONS EMPLOYING
MICROWAVEMODULATED LIGHT. IT VERIFIES A NUMBER OF
SUGGESTIONS FOR CONSTRUCTING MICROWAVE PHOTOTURES
OUTLINED BY THE AUTHORS AT A RECENT CONFERENCE.
(PHYS. REV. 99:1691, 1955) (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-267 857

OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS ANTENNA
LAB

OCT 61 1V LONG, R.K.
REPT. NO. 1083 11
CONTRACT: AF33 616 7081

UNCLASSIFIED REPORT

DESCRIPTORS: ABSORPTION, AMPLIFIERS, ATTENUATION,
COMMUNICATION SYSTEMS, ELECTROMAGNETIC WAVES,
ELECTRONICS LABORATORIES, INFRARED OPTICAL SYSTEMS,
INFRARED RADIATION, LABORATORY EQUIPMENT, LASERS, LIGHT,
MASERS, OPTICAL EQUIPMENT, OPTICAL FILTERS, PHYSICS
LABORATORIES, PROPAGATION, RUBY, SIMULATION,
SPECTROGRAPHIC ANALYSIS, TEST FACILITIES (U)

THE DEVELOPMENT OF OPTICAL MASERS HAS RAISED THE
POSSIBILITY OF THEIR USE IN COMMUNICATION AND HIGH
POWER TRANSMISSION SYSTEMS. AT THE OHIO
STATE UNIVERSITY, A FACILITY WAS CONSTRUCTED TO
MAKE MEASUREMENTS OF THE PROPAGATION EFFECTS
ASSOCIATED WITH SUCH SYSTEMS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-275 591

LOCKHEED MISSILES AND SPACE CO SUNNYVALE CALIF

OPTICAL COMMUNICATIONS: A BIBLIOGRAPHIC SURVEY OF
POSSIBLE SPACE AND TERRESTRIAL APPLICATIONS OF THE
LASER AND MASER (U)

MAR 62 1V GOLDMANN, JACK B.
REPT. NO. SB 62 7
CONTRACT: AF04 647 787

UNCLASSIFIED REPORT

DESCRIPTORS: *BIBLIOGRAPHIES, *LIGHT COMMUNICATION
SYSTEMS, COMMUNICATION THEORY, LASERS, MASERS, SPACE
ENVIRONMENTAL CONDITIONS (U)

THIS ANNOTATED BIBLIOGRAPHY INCLUDES PUBLICATIONS
RELEASED FROM 1959 THROUGH FEBRUARY 1962. THE
SURVEY CONTAINS REFERENCES TO THE SOLID STATE AND GAS-
EOUS AREAS OF INVESTIGATION WHICH HAVE BEEN MADE WITH
REGARDS TO THE APPLICATION OF MASERS AND LASERS TO
OPTICAL COMMUNICATIONS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-284 321

TRW SPACE TECHNOLOGY LABS REDONDO BEACH CALIF

ON THE PRODUCTION OF AND SCATTER PROPAGATION FROM
ARTIFICIAL IRREGULARITIES IN THE IONOSPHERIC D-LAYER(U)

JUN 62 1V GARDNER, JOHN H.;
REPT. NO. 62 532
CONTRACT: AF19 604 8844
MONITOR: AFCRL 62 532

UNCLASSIFIED REPORT

DESCRIPTORS: *IONOSPHERE, *LASERS, *LIGHT COMMUNICATION
SYSTEMS, *MASERS, ANTENNA RADIATION PATTERNS, ANTENNAS,
COMMUNICATION THEORY, DENSITY, ELECTRONS, INTEGRAL
TRANSFORMS, LIGHT, REFRACTIVE INDEX, RELIABILITY, RUBY,
SIGNALS, ULTRAHIGH FREQUENCY (U)

THE POSSIBILITY OF UTILIZING IRREGULARITIES
PRODUCED IN THE IONOSPHERIC D-LAYER BY RF HEATING
OR BY INTENSE OPTICAL RADIATION FROM LASERS TO
ENHANCE FORWARD SCATTER PROPAGATION IS CONSIDERED.
IT IS SHOWN THAT, ON THE ASSUMPTION THAT A
REDUCTION OF ELECTRON DENSITY BY A FACTOR OF TWO CAN
BE ACHIEVED AT 70 KM BY RF HEATING WITH A ONE
MEGAWATT BEAM OF 1 DEGREE HALF-POWER WIDTH AS
CALCULATED BY MOLMUD, FORWARD SCATTER PROPAGATION
WITH REDUCTION IN POWER OF ABOUT 50 DB FROM LINE-OF-
SIGHT PROPAGATION CAN BE ACHIEVED FOR A DISTURBED
IONOSPHERE. IF LASERS ARE USED TO LAY OUT A
DIFFRACTION GRATING IN THE D-LAYER, SIMILAR RESULTS
MAY BE ACHIEVED WITH THE RECEIVED POWER PROPORTIONAL
TO THE SQUARE OF THE NUMBER OF GRATING LINES AND WITH
THE ADDITIONAL POSSIBILITY OF UTILIZING HIGH-ORDER
SPECTRA OF THE GRATING. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-286 062

ARMY RESEARCH OFFICE WASHINGTON D C

LASER PROGRESS AND APPLICATIONS

(U)

DEC 62

1V

MERRILL, HARRISON J.;

UNCLASSIFIED REPORT

DESCRIPTORS: *LASERS, CHROMIUM, COMMUNICATION SYSTEMS,
GUIDANCE, ILLUMINATION, RANGE FINDING, RETINA, RUBY,
SURGERY, THEORY, WELDING (U)

THE INTENSIVE LASER DEVELOPMENT IS BASED ON A CONSIDERATION OF SCHWALOW AND TOWNES WHO DETERMINED THAT OPTICAL STIMULATION COULD OCCUR WHEN THE DIFFERENCE IN ENERGY STATES EXCEEDED A CERTAIN MINIMUM VALUE. THE OUTPUT DEVELOPS THROUGH EMISSION AS THE POPULATION OF A HIGHER ENERGY STATE IS STIMULATED TO RETURN TO THE GROUND LEVEL. THE CONDITION OF OSCILLATION IS CONTROLLED BY REFLECTIVITY OF CAVITY ENDS, THE TEMPERATURE AND THE EFFECTIVE VOLUME. THE MODIFICATION OF THE Q BY CHANGES IN REFLECTIVITY DURING LASER STIMULATION PERMITS OPERATION IN A SINGLE PULSE HAVING A PEAK POWER MORE THAN 3 MEGAWATTS WITH HALF POWER TIME LESS THAN 50 NANO-SEC. THE PINK RUBY DOPED WITH .05% CHROMIUM HAS PROVED MOST USEFUL OPERATED AS THE THREE LEVEL LASER. IMPROVED EFFICIENCY AND QUALITY MAY BE ACHIEVED BY USE OF OTHER MATERIALS. THE LASER SOURCE IS UNIQUE OPTICALLY CHARACTERIZED BY ITS COHERENCE, MONOCHROMATICITY AND HIGH ENERGY DENSITY. IT MAY BE USEFUL IN RANGE FINDING, SPECIAL ILLUMINATION AND COMMUNICATION AND GUIDANCE CONTROL; AS A SOURCE FOR SPECIAL SCIENTIFIC INVESTIGATIONS; IT HAS ALREADY FOUND USES IN MICRO-WELDING AND FOR RESTORING DETACHED RETINAS IN THE EYE. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-286 611

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

AN ASTRO-SHIP CALLS THE EARTH (SUPER-LONG DISTANCE
COMMUNICATIONS WITH A SPACE SHIP) (U)

AUG 62 1V SOKOLOV,V.A.;IVANOV,YU. F.
REPT. NO. TT 62 721

UNCLASSIFIED REPORT

DESCRIPTORS: *LIGHT COMMUNICATION SYSTEMS, *RADIO
COMMUNICATION SYSTEMS, *SPACECRAFT, AIR-TO-SURFACE,
LASERS, RUBY, SPACE COMMUNICATION SYSTEMS, SURFACE-TO-
AIR, THEORY, TRANSLATIONS (U)
IDENTIFIERS: USSR (U)

SUPER LONG-DISTANCE COMMUNICATIONS WITH SPACESHIPS
TRANSLATION USSR.

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-286 641

ARMY RESEARCH OFFICE WASHINGTON D C

INVESTIGATIONS ON A BEAM WAVEGUIDE FOR OPTICAL
FREQUENCIES

(U)

DEC 62

1V

GOURAU, G.; CHRISTIAN, J. R. I

UNCLASSIFIED REPORT

DESCRIPTORS: *LASERS, *LIGHT COMMUNICATION SYSTEMS,
*WAVEGUIDES, DIELECTRICS, ELECTROMAGNETIC LENSES, LIGHT,
LIGHT PULSES, MEASUREMENT, MICROWAVES, OPTICAL
EQUIPMENT, WAVEGUIDE IRISES

(U)

A BEAM WAVEGUIDE OF 970M LENGTH WAS CONSTRUCTED TO
DETERMINE ITS APPLICABILITY TO THE TRANSMISSION
OF COHERENT LIGHT.

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-293 452

PHILCO CORP BLUE BELL PA

STUDY AND INVESTIGATION OF ACQUISITION AND TRACKING
OF OPTICAL COMMUNICATION SYSTEMS (U)

NOV 62 1V ANDERSON, R.F.;
REPT. NO. TDR62 733
CONTRACT: AF33 616 8392
MONITOR: ASD TDR62 733

UNCLASSIFIED REPORT

DESCRIPTORS: *LIGHT COMMUNICATION SYSTEMS, *LUNAR
PROBES, *OPTICAL TRACKING, *SATELLITES (ARTIFICIAL),
*SPACECRAFT, AIR-TO-AIR, AIRBORNE, ANALOG COMPUTERS,
COMMUNICATION EQUIPMENT, COMMUNICATION SYSTEMS,
COMMUNICATION THEORY, CONTROL SYSTEMS, ERRORS, IMAGE
TUBES, INTERFERENCE, LASERS, MATHEMATICAL ANALYSIS,
NUMERICAL ANALYSIS, ORBITAL TRAJECTORIES, PROBABILITY,
SATELLITE ATTITUDE, SIGNAL-TO-NOISE RATIO, SOLAR
RADIATION, SOLAR SYSTEMS, SPACE COMMUNICATION SYSTEMS,
SPACE ENVIRONMENTAL CONDITIONS, STAR TRACKERS, STARS,
SUN (U)

ACQUISITION AND TRACKING AS APPLIED TO
REPRESENTATIVE OPTICAL COMMUNICATION SYSTEMS ARE
STUDIED. THE TWO HYPOTHETICAL COMMUNICATION LINKS
CONSIDERED WERE BETWEEN AN EARTH-ORBITING SATELLITE
AND A MOON-ORBITING SATELLITE AND BETWEEN AN EARTH-
ORBITING SATELLITE AND A CISELUNAR SPACE VEHICLE.
THE RESULTS SHOW THAT ACQUISITION AND TRACKING ARE
FEASIBLE. THE STUDY INCLUDES A TYPICAL SYSTEM
DESIGN BASED ON THE USE OF A LASER COMMUNICATION TRAN-
SMITTER. THIS SUBSYSTEM UTILIZES A FIVE-MOTOR
GIMBAL CONFIGURATION WHICH MOUNTS THE OPTICAL
SYSTEMS AND SENSORS THAT PERFORM THE FAR-BODY
TRACKING FUNCTION AND THE ACQUISITION AND TRACKING
OF THE COMMUNICATION BEAM. AN IMAGE TUBE IS USED
AS THE ACQUISITION SENSOR IN ORDER TO OBTAIN HIGH
SCANNING RATES. THE TRACKING SENSOR DESIGN IS
BASED ON STATE-OF-THE-ART STAR TRACKER AND UTILIZES
A MULTIPLIER PHOTOTUBE. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-407 612
ILLINOIS UNIV URBANA

STUDY OF MODULATION AND DETECTING OF COHERENT
OPTICAL RADIATION.

(U)

DESCRIPTIVE NOTE: FINAL SUMMARY REPT.
FEB 63 2P HOLSHOUSER, D. F. ;
CONTRACT: AF-AFOSR-62-250
PROJ: AF-9767
TASK: 976702
MONITOR: AFOSR 4812

UNCLASSIFIED REPORT

DESCRIPTORS: *MICROWAVES, *MICROWAVE EQUIPMENT,
LIQUIDS, DIELECTRICS, CARBON COMPOUNDS,
SULFIDES, MICROWAVE FREQUENCY, DETECTION,
OPTICAL INSTRUMENTS, MEASUREMENT, KERR CELLS,
TEMPERATURE, LASERS, PHOTOMULTIPLIERS,
NEODYMIUM, ELECTRON MULTIPLIERS, MODULATION,
LIGHT.
IDENTIFIERS: 1963.

(U)
(U)

MICROWAVE-MODULATED LIGHT; FINAL SUMMARY REPT.

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-410 571

OHIO STATE UNIV COLUMBUS

ABSORPTION OF LASER RADIATION IN THE ATMOSPHERE.

(U)

MAY 63 150P LONG, RONALD K.
REPT. NO. 1579-3, 3630-5237
CONTRACT: AF 33 657 10824
PROJ: 5237
TASK: 523704

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON STUDY OF MICROWAVE
PROPAGATION.

DESCRIPTORS: (*LASERS, COMMUNICATIONS SYSTEMS),
(*ATMOSPHERE, ABSORPTION), MICROWAVE SPECTROS
COPY, SOLAR SPECTRUM, DETECTION, MEASUREMENT,
OZONE, NITROGEN COMPOUNDS, OXIDES, HELIUM GROUP
GASES, RARE EARTH ELEMENTS, ATTENUATION, MODU-
LATION, OPTICAL PROPERTIES, RUBY.
IDENTIFIERS: METHANE, 1963.

(U)

(U)

LASER RADIATION ABSORPTION IN THE ATMOSPHERE.

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-420 983

AMERICAN OPTICAL CO SOUTHBRIDGE MASS

EXPERIMENTAL VERIFICATION OF SUN-POWERED LASER
TRANSMITTER. (U)

DESCRIPTIVE NOTE: FINAL REPT., MAR 62-MAY 63,

AUG 63 110P SIMPSON, G. R. ;

CONTRACT: AF33 657 8619

PROJ: 4335

TASK: 433513

MONITOR: ASD TDR63 727

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, DESIGN), (*COMMUNICATION SYSTEMS,
SUN), SOLAR RADIATION, THERMAL STRESSES, OPTICAL
EQUIPMENT, CALCIUM COMPOUNDS, TUNGSTATES, IMPURITIES,
NEODYMIUM, GLASS, RUBY, HEAT EXCHANGERS, COOLANT PUMPS,
TENSILE PROPERTIES, OPTICAL TRACKING, FIBER OPTICS (U)
IDENTIFIERS: OPTICAL TRANSMITTERS, 1963 (U)

A PROGRAM OF DESIGN AND EXPERIMENTATION LEADING TO
THE DELIVERY OF AN EXPERIMENTAL MODEL OF A SUN-
POWERED LASER TRANSMITTER IS PRESENTED. ANALYTICAL
WORK IS PRESENTED WHICH RESULTED IN THE CHOICE OF
ND:CAW04 AND ND:GLASS AS CANDIDATES FOR CW
SUN-POWERED OPERATION. THE DESIGN AND FABRICATION
OF THE TRANSMITTER MOUNT, PUMP OPTICS AND LASER
CAVITIES IS DESCRIBED. COOLING TECHNIQUES DEVELOPED
(PRIMARILY ORIENTED TOWARD CAW04 ALTHOUGH
GENERALLY APPLICABLE TO ANY SOLID LASER MATERIAL
OPERATING AT ROOM TEMPERATURE) AND THE DESIGN OF
THE COOLING SYSTEM ARE DETAILED. EXPERIMENTAL
EVALUATION OF A NUMBER OF LASER CONFIGURATIONS OF THE
MATERIALS DISCUSSED IS PRESENTED. APPENDICES ARE
PROVIDED WHICH GIVE (1) DEFINITION AND
MEASUREMENT OF LOSS COEFFICIENT ' α ', (2) THE
DERIVATION OF THE FIGURE OF MERIT ' η ' FOR A 4-
LEVEL SYSTEM BASED ON QUANTITIES B, THE GAIN
COEFFICIENT FOR LIGHT IN A LASER AND ' α ', (3)
THE DERIVATION OF THE GAIN COEFFICIENT BETH, (4)
THE METHOD OF CALCULATION OF THE POWER OUTPUT OF A
CW LASER OSCILLATOR, (5) THE METHOD USED IN
OBTAINING THERMAL CONDUCTIVITY MEASUREMENTS AND
(6) A DESCRIPTION OF THE ORIGINAL ROOM
TEMPERATURE OPERATION OF GLASS LASERS. FINALLY,
RECOMMENDATIONS ARE GIVEN FOR FUTURE INVESTIGATIONS
OF SUN-POWERED LASER OPERATION. (AUTHOR) (U)

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /7LW13

AD-422 511

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

INFRARED AND VISIBLE LIGHT EMISSION FROM
FORWARDBIASED P-N JUNCTIONS,

(U)

43 10P REDIKER, R. H. ;

UNCLASSIFIED REPORT

REPRINT FROM SOLID/STATE/DESIGN, PP. 3-12, AUG 63.

(COPIES NOT SUPPLIED BY DDC)

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*SEMICONDUCTOR DEVICES,
ELECTROLUMINESCENCE), (*LASERS, SEMICONDUCTOR DEVICES),
(*LIGHT COMMUNICATION SYSTEMS, TELEVISION EQUIPMENT),
(*MASERS, SEMICONDUCTOR DEVICES), INJECTION, DIODES
(SEMICONDUCTOR), TRANSISTORS, GALLIUM ALLOYS, ARSENIC
ALLOYS, INDIUM ALLOYS, PHOSPHORUS ALLOYS, LIGHT
TRANSMISSION, INFRARED RADIATION, SPECTRA (INFRARED),
SPECTRA (VISIBLE AND ULTRAVIOLET), PHOTONS (U)
IDENTIFIERS: 1963, BEAM-OF-LIGHT TRANSISTOR (U)

EFFORTS WERE DIRECTED TOWARD SEMICONDUCTOR DIODE
LIGHT SOURCES AND SEMICONDUCTOR DIODE OPTICAL MASERS
(LASERS) WHICH ARE THE FIRST PRACTICAL DEVICES IN
A NEW FIELD FOR SEMICONDUCTOR DEVICES THAT INVOLVES
THE EFFICIENT CONVERSION OF ELECTRICAL ENERGY INTO
INFRARED AND VISIBLE LIGHT. IN THE FIRST PART OF
THIS PAPER GAAS DIODES WILL BE DESCRIBED WHICH
PRODUCE INCOHERENT INFRARED RADIATION WITH HIGH
EFFICIENCY AS ORIGINALLY ANNOUNCED BY KEYES AND
QUIST. INCOHERENT RADIATION, RADIATION SUCH AS
IS OBTAINED FROM LIGHT BULBS AND FROM SPARK GAP
TRANSMITTERS, HAS MANY DISADVANTAGES AS COMPARED TO
COHERENT RADIATION SUCH AS IS NOW USED IN RADIO AND
RADAR. ON THE OTHER HAND, INCOHERENT RADIATION CAN
BE USED IN MANY APPLICATIONS AND I WILL DESCRIBE
BELOW AN EXPERIMENT IN WHICH AUDIO AND VIDEO SIGNALS
HAVE BEEN TRANSMITTED 30 MILES ON A BEAM OF THE
INCOHERENT INFRARED RADIATION EMITTED BY A GAAS
DIODE. MASER DIODES WILL THEN BE DESCRIBED:
GAAS DIODES AND INAS DIODES WHICH EMIT
COHERENT INFRARED RADIATION, AND GAASXP1-X
DIODES WHICH EMIT COHERENT VISIBLE RADIATION.
(AUTHOR)

(U)

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-425 126

ARMY ELECTRONICS LABS FORT MONMOUTH N J

DIRECT MODULATION OF A HF-NE GAS LASER, (U)

MAR 63 2P SCHIEL, E. J. ; HOLMARCICH, J.
J. ;

UNCLASSIFIED REPORT

REPRINT FROM PROCEEDINGS OF THE IEEE, PP. 940-941,
JUNE 63. (COPIES NOT SUPPLIED BY DDC)

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, GASE.), HELIUM, NEON, MODULATION,
DISCHARGE TUBES, IMAGE TUBES, ELECTRODES (U)
IDENTIFIERS: 1963, PHOTODIODES (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-434 378

ITT COMMUNICATION SYSTEMS INC PARAMUS N J

APPLICABILITY OF LASER TECHNIQUES,

(U)

MAR 64 80P LITCHMAN, W. S. ;
REF. NO. 64TR379
CONTRACT: AF19 628 3358
MONITOR: ESD TDR64 249

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, COMMUNICATION SYSTEMS), LIGHT
TRANSMISSION, MODULATION, DETECTION, LIGHT COMMUNICATION
SYSTEMS, SURFACE-TO-SURFACE, SURFACE-TO-SPACE, SPACE-TO-
SPACE, SPACE-TO-SURFACE, DETECTORS, MAGNETO-OPTIC
EFFECT, MODULATORS, INTERFEROMETERS, ELECTROOPTICAL
PHOTOGRAPHY, PROPAGATION, MATERIALS, FREQUENCY, OPTICAL
EQUIPMENT, OPTICAL EQUIPMENT COMPONENTS (U)

IDENTIFIERS: POCKET CELLS, DEMODULATION, FARADAY
EFFECT, COTTON-MOUTON EFFECT, POCKEL'S EFFECT, 1964 (U)

LASER COMMUNICATION TECHNIQUES ARE PRESENTED THAT
CAN BE INTEGRATED INTO THE AIRCOM SYSTEM TO SATISFY
UNMET CURRENT AND ESTIMATED FUTURE AF REQUIREMENTS.
THE ADVENT OF THE LASER HAS AROUSED GREAT INTEREST
AMONG COMMUNICATION ENGINEERS BECAUSE IT AFFORDS USE
OF A NEW SPECTRUM MILLIONS OF MEGACYCLES WIDE.
ALTHOUGH THE LASER WILL HAVE A GREAT IMPACT IN
CERTAIN AREAS OF COMMUNICATIONS TECHNOLOGY, ITS
POTENTIAL IN ANY SPECIFIC AREA MUST BE CAREFULLY
EVALUATED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-462 245

REDSTONE SCIENTIFIC INFORMATION CENTER REDSTONE ARSENAL
ALA

LASERS,

(U)

APR 64 42P CARAS, GUS J. ;
REPT. NO. RSIC-195

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, BIBLIOGRAPHIES),

(*BIBLIOGRAPHIES, LASERS), REVIEWS, RUBY, MEDICAL
RESEARCH, DETECTION, COMMUNICATION SYSTEMS, GUIDANCE,
MANUFACTURING METHODS, FIBER OPTICS, GALLIUM ALLOYS,
INDIUM ALLOYS, SILICON ALLOYS, ARSENIDES, PHOSPHIDES,
ANTIMONY ALLOYS, CRYOGENICS, PUMPING (ELECTRONICS),
FREQUENCY

(U)

IDENTIFIERS: OPTICAL PUMPING, FOUR-LEVEL LASERS, GAS
LASERS, LIQUID LASERS, SEMICONDUCTOR LASERS, SOLID
STATE LASERS

(U)

THIS STATE-OF-THE-ART SURVEY CONSISTS OF TWO
SECTIONS, A TECHNICAL SUMMARY AND A BIBLIOGRAPHY.
ALTHOUGH THE BIBLIOGRAPHY, WHICH CONSISTS OF 125
REFERENCES AND COVERS THE PERIOD OF 1 JANUARY 1963
TO 31 DECEMBER 1963 DEALS MOSTLY WITH THE SUBJECT
OF LASER PUMPING, THE SUMMARY REVIEWS OTHER TOPICS OF
LASER TECHNOLOGY INCLUDING A DESCRIPTION OF THE
VARIOUS TYPES OF LASERS AND THEIR POTENTIAL
APPLICATIONS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-466 031

DAYTON UNIV OHIO RESEARCH INST

ATMOSPHERIC PROPAGATION STUDIES AT OPTICAL,
MILLIMETER, AND MICROWAVE FREQUENCIES. PART II. THE
MECHANISM OF SCINTILLATION. (U)

DESCRIPTIVE NOTE: REPT. FOR 1 JAN 64-20 JAN 65,

MAR 65 20P TAYLOR, PAUL B. ;

CONTRACT: AF33 615 1265

PROJ: 4062

TASK: 02

MONITOR: AL TR-65-79-PT. 2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*MICROWAVES, PROPAGATION),
(*MILLIMETER WAVES, PROPAGATION), (*LASERS,
PROPAGATION), LIGHT TRANSMISSION, RADIO
TRANSMISSION, VISIBILITY, LIGHT, MEASUREMENT,
ATMOSPHERIC MOTION, OPTICAL IMAGES, REFRACTION,
IONOSPHERE, ANALYSIS (U)
IDENTIFIERS: SCINTILLATION (U)

THE SCINTILLATION OF RECEIVED SIGNALS PROPAGATED
THROUGH SOME TEN MILES OF ATMOSPHERE ON NARROW BEAMS
(ONE AT AN OPTICAL FREQUENCY, THE OTHER AT A
MICROWAVE FREQUENCY) HAVE BEEN REPORTED IN PART
I. THE PRESENT REPORT REVIEWS SEVERAL EXPLANATIONS
WHICH MIGHT ACCOUNT FOR THE PHENOMENA. IT IS FOUND
THAT THE SCINTILLATION OBSERVED IN THE MICROWAVE
SIGNAL IS NOT OUT OF LINE WITH THE STATISTICAL
THEORIES OF PROPAGATION THROUGH A RANDOMLY
HOMOGENEOUS ATMOSPHERE WHICH HAVE BEEN PROPOSED BY
OTHERS. HOWEVER, A PRECISE DESCRIPTION OF THE
MECHANISM IS STILL WANTING. THE SCINTILLATION
OBSERVED IN THE OPTICAL SIGNAL IS MORE VIOLENT THAN
ANY PREVIOUSLY REPORTED, AND SHOWS CHARACTERISTICS AT
VARIANCE WITH THE STATISTICAL THEORIES OF THE
ATMOSPHERE PRESENTED IN THE LITERATURE--NAMELY, IN
THE OCCURRENCE OF SHORT INTENSE BURSTS OF SIGNAL
SUPERIMPOSED ON A LOW-LEVEL RANDOMLY FLUCTUATING
BACKGROUND. SCINTILLATION IN ANALOGOUS PHENOMENA,
ESPECIALLY THAT OF RADIO AND OPTICAL STARS, SHOWS
INDICATIONS OF SIMILAR TRAITS. THE SEVERAL
EXPLANATIONS WHICH HAVE BEEN PROPOSED ARE MUTUALLY AT
VARIANCE, AND NONE STANDS UP WELL UNDER CRITICISM.
FURTHER EXPERIMENT AND STUDY IS REQUIRED IF A
TENABLE EXPLANATION IS TO BE ESTABLISHED.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-476 149 20/5
CALIFORNIA UNIV BERKELEY ELECTRONICS RESEARCH LAB
LASER ARRAYS. (U)

DESCRIPTIVE NOTE: RESEARCH REPT.,
JUL 65 44P GIBSON, JAMES CLARK ;
REPT. NO. FRL-65-21
CONTRACT: AF-AFOSR-139-64, AF-AFOSR-139-65
PROJ: AF-4751
MONITOR: AFOSR 66-0402

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, *ANTENNA ARRAYS), ANTENNA
CONFIGURATIONS, ANTENNA RADIATION PATTERNS, SPACE
COMMUNICATION SYSTEMS, POLARIZATION, MATHEMATICAL
ANALYSIS (U)
IDENTIFIERS: LINEAR BROADSIDE ARRAYS, DOLPH-
TCHERBYSCHEFF ARRAYS, UNEQUALLY SPACED ARRAYS,
SINGLE RING ARRAYS (U)

THIS PAPER DEALS WITH THE APPLICATION OF VARIOUS
TYPES OF ARRAY TECHNIQUES. THE LASER IS ASSUMED TO
HAVE A GAUSSIAN FIELD DISTRIBUTION AT ITS APERTURE,
AND ITS FAR FIELD PATTERN IS DEVELOPED FROM THIS
APERTURE PATTERN. THE LINEAR BROADSIDE ARRAY
FACTOR IS APPLIED TO BOTH THE GAUSSIAN ELEMENT
PATTERN AND TO AN ELEMENT CONSISTING OF A CIRCULAR
APERTURE UNIFORMLY ILLUMINATED WITH A PLANE WAVE.
THE DOLPH-TCHERBYSCHEFF AND BINOMIAL AMPLITUDE
DISTRIBUTION ARRAY FACTORS ARE APPLIED TO THE
GAUSSIAN ELEMENT PATTERN TO REDUCE SIDELobe LEVELS
WITH EQUAL ELEMENT SPACING. ISHIMARU'S TECHNIQUE
OF UNEQUAL ELEMENT SPACING IS APPLIED TO THE
GAUSSIAN ELEMENT PATTERN TO REDUCE SIDELOBES, AND
THEN TO SUPPRESS THE SECONDARY BEAM. THE HALF-POWER
BEAMWIDTHS ARE CALCULATED AND COMPARED, AND THE
CIRCULAR ARRAY IS INVESTIGATED FOR APPLICATION TO THE
GAUSSIAN ELEMENT PATTERN. RESULTS CONCERNING
RELATIVE SIDELobe LEVELS AND GRATING LOBE LEVELS ARE
TABULATED AND COMPARED. CONCLUSIONS ARE MADE
CONCERNING THE FEASIBILITY OF APPLYING ARRAY THEORY
TO LASERS WITH ELEMENT SPACINGS OF HUNDREDS OF
WAVELENGTHS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-601 660

ROME AIR DEVELOPMENT CENTER GRIFFISS AFB N Y

IN-CAVITY LASER MODULATION STUDY,

(U)

MAY 64 25P RUGARIL, ANTHONY D. ;

PROJ: DS63 9

MONITOR: RADC TOR64 129

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, MODULATION), ELECTRON OPTICS, MIRRORS, PRISMS (OPTICS), CRYSTALS, POTASSIUM COMPOUNDS, PHOSPHATES, QUARTZ, REFRACTIVE INDEX, LIGHT TRANSMISSION, OSCILLATION, DISPLAY SYSTEMS (U)

THEORETICAL AND EXPERIMENTAL STUDY WAS PERFORMED TO INVESTIGATE A LASER MODULATION TECHNIQUE CAPABLE OF PROVIDING A FLAT FREQUENCY RESPONSE OVER THE RANGE OF 30 CPS TO 30 MC/S WITH A MODULATION INDEX OF 0.5 OR GREATER. THE TECHNIQUE INVOLVED THE INTRODUCTION OF CONTROLLABLE LOSSES TO THE LASER CAVITY BY ALTERNATE ALIGNMENT AND MISALIGNMENT OF THE CAVITY REFLECTORS. THIS WAS TO BE ACCOMPLISHED BY INSERTION OF AN ELECTRO-OPTIC PRISM IN THE CAVITY AND VARYING THE ANGLE OF DEVIATION OF THE EXIT BEAM FROM THE PRISM BY ELECTRICALLY CONTROLLING THE MAGNITUDE OF THE INDEX OF REFRACTION OF THE PRISM. THE TRANSMISSION LOSSES ASSOCIATED WITH THE ELECTROOPTIC PRISM WERE EXPERIMENTALLY FOUND TO BE GREATER THAN THE GAIN OF THE LASER CAVITY. THUS, OSCILLATIONS COULD NOT BE MAINTAINED WITH THE ELECTRO-OPTIC PRISM IN THE CAVITY. THE MAJOR FACTORS CONTRIBUTING TO THE TRANSMISSION LOSSES WERE FOUND TO BE REFLECTION LOSSES AND AN INHERENT BIRFRINGENCE OF THE CRYSTALLINE MATERIALS. PERTINENT THEORETICAL DISCUSSIONS AND EXPERIMENTAL RESULTS ARE INCLUDED IN THE REPORT. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-603 004

BAIRD ATOMIC INC CAMBRIDGE MASS

EFFECT OF OPTICAL PATH IMPERFECTIONS ON FARRY-PEROT
MODULATOR PERFORMANCE. (U)

DESCRIPTIVE NOTE: REPT. FOR 17 FEB-17 JUL 64,
64 78P DELPIANO, VINCENT, JR.;

CONTRACT: AF 33(615)-1254

PROJ: AF-4335

TASK: 433513

MONITOR: AFAL TDR-64-141

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*MODULATORS, PERFORMANCE (ENGINEERING)),
LASERS, LIGHT TRANSMISSION, REFRACTION, BROADBAND,
AMPLIFIERS, FREQUENCY, PROBABILITY, INTERFEROMETERS,
PIEZOELECTRIC CRYSTALS, SURFACE PROPERTIES, POTASSIUM
COMPOUNDS, PHOSPHATES (U)
IDENTIFIERS: FARRY-PEROT MODULATOR, ELECTRO-OPTIC
EFFECT, POTASSIUM DIHYDROPHOSPHATE (U)

UNDER A PREVIOUS CONTRACT, A THEORETICAL INVESTIGATION WAS CONDUCTED ON THE EFFECTS OF VARIATION IN OPTICAL PATHLENGTH UPON THE PERFORMANCE OF A FABRY-PEROT TYPE WIDEBAND MODULATOR. THE VARIATIONS CONSISTED OF STATISTICAL DISTRIBUTIONS WITHIN OR ACROSS THE APERTURE, AND TWO PROBABILITY DISTRIBUTIONS OF THE VARIABLE PATHLENGTH WERE STUDIED: A RECTANGULAR AND A GAUSSIAN. THE OBJECTIVE OF THE PRESENT WORK WAS TO PROVIDE DIRECT EXPERIMENTAL VERIFICATION OF THE THEORETICAL RESULTS OF THE PROBABILITY STUDY AS WELL AS TO CHARACTERIZE AND ACCESS THE PRESENT PERFORMANCE OF THE MODULATOR IN ORDER TO PROVIDE GUIDANCE FOR FUTURE WORK. IT IS SHOWN THAT THE PLANE-PARALLEL FABRY-PEROT TYPE OF MODULATOR WILL APPROACH IDEAL THEORETICAL PERFORMANCE ONLY FOR EXTREMELY SMALL APERTURES OF THE ORDER OF 0.045 INCH OR LESS AND THAT THIS RESULT IS IN ACCORDANCE WITH THE THEORETICALLY PREDICTED PERFORMANCE. IT IS FURTHER SHOWN THAT THE MODULATOR PERFORMANCE DEPENDS CRITICALLY UPON THE FREQUENCY STABILITY AND BANDWIDTH OF THE SOURCE AND THAT FREQUENCY DRIFTS, $f \text{ SUB } 0$, GREATER THAN A FEW MEGACYCLES WILL CAUSE LARGE FLUCTUATIONS IN THE AVERAGE TRANSMISSION. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-603 622

CONTROL DATA CORP MELVILLE N Y TRG DIV

HETERODYNE DETECTION IN OPTICAL COMMUNICATION. (U)

DESCRIPTIVE NOTE: FINAL REPT.,

JUL 64 307P JACOBS, S. F. ; LATOURETTE,
J. T. ; GOULD, G. ; RABINOWITZ, P. ;

CONTRACT: AF30 602 2591

PROJ: 4519

TASK: 451905

MONITOR: RADC , TOR64 130

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS, MODULATION),
(*MODULATION, LIGHT COMMUNICATION SYSTEMS), LASERS,
INTERFEROMETERS, MIXERS (ELECTRONIC), SIGNAL-TO-NOISE
RATIO, NOISE (RADIO), LIGHT TRANSMISSION, REFLECTORS,
BROADBAND, AMPLIFIERS, OPTICS, MEASUREMENT, THEORY,
EQUATIONS (U)

IDENTIFIERS: HETERODYNE (U)

THE PROPERTIES OF OPTICAL HETERODYNE DETECTION ARE ANALYZED AND MEASURED, USING A LASER AND TWYMAN-GREEN INTERFEROMETER. IT IS SHOWN THAT HETERODYNE AMPLIFICATION PRESERVES THE SIGNAL-TO-NOISE RATIO IN THE DETECTED DIFFERENCE FREQUENCY IN THE PRESENCE OF INCOHERENT NOISE AND THAT THE LIMITING NOISE OF THE SYSTEM IS PHOTOCURRENT SHOT NOISE. SUITABILITY OF THIS TECHNIQUE IS DEMONSTRATED FOR DIFFUSE AS WELL AS SPECULAR MIRRORS AND CORNER REFLECTORS AS WELL AS FLATS. VARIOUS TECHNIQUES OF MODULATION ARE DISCUSSED AND DEMONSTRATED, INCLUDING PHASE, AMPLITUDE AND SINGLE-SIDEBAND MODULATION. A METHOD IS DEVELOPED FOR THE DEMODULATION OF PHASE-MODULATED LIGHT. THE LIMITATIONS IMPOSED ON THE OPTICAL HETERODYNE TECHNIQUE BY THE TRANSMISSION PATH CONDITIONS ARE INVESTIGATED. SINGLE-SIDEBAND VS DOUBLE-DETECTION TECHNIQUES ARE COMPARED EXPERIMENTALLY, UNDER TURBULENT ATMOSPHERIC CONDITIONS. THE FORMER PROVES TO BE THE SUPERIOR TECHNIQUE. DESIGN AND CONSTRUCTION OF A FIELD INSTRUMENT EMBODYING THIS PRINCIPLE IS INITIATED. THE USES AND LIMITATIONS OF HETERODYNE DETECTION IN OPTICAL COMMUNICATIONS, DEMULTIPLEXING OF CHANNELS, DEMODULATION OF FM AND AM, DOPPLER AND DISPLACEMENT MEASUREMENTS, AND LASER STABILIZATION ARE DISCUSSED. RECOMMENDATIONS ARE MADE FOR FUTURE RESEARCH AND DEVELOPMENT. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-604 735

BEGE (J R M) CO ARLINGTON MASS

LASER BEAM ATTENUATION IN THE LOWER ATMOSPHERE, (U)

NOV 63 86P LANGER, R. M. ;

REPT. NO. 6331

CONTRACT: NOBS8A609

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, ELECTROMAGNETIC WAVES),
(*ELECTROMAGNETIC WAVES, ATTENUATION), (*ATMOSPHERE,
LIGHT TRANSMISSION), WAVE TRANSMISSION, CLOUDS,
REFRACTIVE INDEX, AEROSOLS, SCATTERING, ABSORPTION,
OPTICS (U)

SMALL ANGLE SPREADING, AEROSOL SCATTERING AND
MOLECULAR ABSORPTION ARE CONSIDERED THE IMPORTANT
MECHANISMS FOR THE WEAKENING OF A LASER BEAM IN THE
OPEN ATMOSPHERE. THREE DIFFERENT TRANSMISSION LAWS
ARE WORKED OUT FOR THESE THREE MECHANISMS. BOTH
THE PHYSICAL PRINCIPLES AND THE NUMERICAL VALUES
ENCOUNTERED IN THE LOWER ATMOSPHERE ARE DISCUSSED AND
ILLUSTRATED. RANDOM DENSITY FLUCTUATIONS IN THE
TURBULENT ATMOSPHERE ARE DISCUSSED AS THE CAUSE OF
SMALL ANGULAR DEFLECTIONS IN A NARROW PENCIL OF
LIGHT. BEAM ATTENUATION DUE TO ATMOSPHERIC AEROSOL
SCATTERING IS TREATED FOR AN AEROSOL SIZE
DISTRIBUTION DESCRIBED BY THE SUM OF TWO INVERSE
POWERS OF THE DROPLET RADIUS. LASER BEAMS CAN HELP
FIND THE PARAMETERS OF SUCH DISTRIBUTIONS.
MOLECULAR ABSORPTION IS EXAMINED IN TERMS OF THE
NARROW INFRARED LINES OF WATER VAPOUR. AN EFFORT
IS MADE TO PRESENT THIS DIFFICULT TOPIC IN AS SIMPLE
AND USEFUL A FORM AS IS COMPATIBLE WITH THE
OBSERVATIONAL MATERIAL. THE FORMULAE ARE DESIGNED
TO MAKE IT POSSIBLE TO ESTIMATE IN DETAIL HOW THE
ATMOSPHERE WOULD WEAKEN A LASER BEAM UNDER A WIDE
VARIETY OF CONDITIONS. IT IS FOUND THAT SOME
EFFECTS ARE SERIOUS EVEN AT SHORT RANGES OF A FEW
METERS, WHILE IN FAVOURABLE CIRCUMSTANCES, LASER
SIGNALS WOULD NOT BE DRASTICALLY ATTENUATED OUT TO
ANY PRACTICAL DISTANCE IN THE LOWER ATMOSPHERE.
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-605 319

TECHNICAL OPERATIONS INC BURLINGTON MASS

INVESTIGATION OF COHERENT OPTICAL PROPAGATION. (U)

DESCRIPTIVE NOTE: FINAL REPT.

AUG 64 64P SKINNER, T. J. WHITNEY, R. E.

CONTRACT: AF30 602 2619

PROJ: 4519

TASK: 451905

MONITOR: RADC , TDR64 65

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, LIGHT TRANSMISSION), (*LIGHT SIGNALS, PROPAGATION), (*LIGHT COMMUNICATION SYSTEMS, LASERS), WAVEGUIDES, OPTICAL EQUIPMENT COMPONENTS, WAVEGUIDE BENDS, ALIGNMENT, FLEXIBLE COUPLINGS, PRISMS (OPTICS) (U)

THE REPORT DISCUSSES THE GUIDED PROPAGATION OF AN OPTICAL SIGNAL. THE BEAM-WAVEGUIDE WAS CHOSEN FOR CONSIDERATION BECAUSE OF ITS EXTREMELY LOW INTRINSIC LOSS. THESE INTRINSIC LOSSES, ALONG WITH MISALIGNMENT AND FEED LOSSES, ARE DERIVED. THE MISALIGNMENT LOSSES ARE HIGH. TO REDUCE THEM, A FLEXIBLE JOINT WAS DESIGNED THAT ALLOWS THE GUIDE TO FLX WITHOUT INTRODUCING PROHIBITIVE LOSSES. ALTHOUGH MUCH WORK REMAINS TO BE DONE BEFORE A PRACTICAL OPTICAL WAVEGUIDE FOR LONG PATHS EXISTS, THE REPORT DEMONSTRATES THE FEASIBILITY OF THE BEAM-WAVEGUIDE. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-605 466

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

GAS AND LIQUID LASERS,

(U)

AUG 64 8P TSENG, CHAO-SHOU ;
REPT. NO. FTD-TT-64-565

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF K'IO HSUEH TA
CHUNG (CHINESE PEOPLE'S REPUBLIC) 1963, NO. 11, P.
22-23.

DESCRIPTORS: (*LASERS, REVIEWS), GASES, LIQUIDS, LIGHT
COMMUNICATION SYSTEMS, CHINA (U)

A POPULARIZED REVIEW OF THE BASIC PRINCIPLES OF GAS
AND LIQUID LASERS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-605 478

SYLVANIA ELECTRONIC SYSTEMS-WEST MOUNTAIN VIEW CALIF
ELECTRONIC DEFENSE LABS

RESEARCH OF TECHNIQUES FOR LIGHT MODULATION
DETECTION. PART I. AMPLITUDE DEMODULATORS.

(U)

DESCRIPTIVE NOTE: FINAL REPT. (PART 1), 15 MAY 62-15
MAY 63,

JUN 64 136P MCMURTRY, B. J.; CANDES, D. F.;
TARG, R.; SIEGMAN, A. F.;
CONTRACT: AF33 657 8995
PROJ: AF-4156
TASK: 415610
MONITOR: AFAL TDR-64-181-PT-1

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: ALSO SEE AD-410 264

DESCRIPTORS: (*LIGHT, DEMODULATION), (*AMPLITUDE
MODULATION, LIGHT), (*PHOTOTUBES, MICROWAVE EQUIPMENT),
LIGHT COMMUNICATION SYSTEMS, TRAVELING WAVE TUBES,
LASERS, BROADBAND, MICROWAVE FREQUENCY,
PHOTOMULTIPLIERS, ELECTRON GUNS, LIGHT TRANSMISSION,
VELOCITY, DEMODULATORS, NOISE (RADIO), ELECTRON DENSITY,
PHOTOCATHODES, DESIGN, CONSTRUCTION, TESTS (U)
IDENTIFIERS: TRAVELING-WAVE MICROWAVE PHOTOTUBES (U)

THE RESULTS OF A ONE-YEAR APPLIED RESEARCH PROGRAM
ON THE DEMODULATION OF AMPLITUDE-MODULATED (AM)
LIGHT ARE PRESENTED. SUFFICIENT INFORMATION IS
PROVIDED FOR THE DETAILED UNDERSTANDING, DESIGN, AND
USE OF TRAVELING-WAVE MICROWAVE PHOTOTUBES (TWPS).
THE MOST PROMISING DETECTOR FOR BROADBAND-MODULATED
LIGHT. THE REPORT INCLUDES: (1) THE IDEALIZED
ANALYSIS WHICH FIRST POINTED OUT THE MORE IMPORTANT
TWP DESIGN CONSIDERATIONS AND OPERATING
CHARACTERISTICS; (2) A MORE COMPLETE
COMPUTERAIDED ANALYSIS WHICH GIVES DETAILED
INFORMATION ON THE EFFECTS OF THE VARIOUS BEAM-
CIRCUIT PARAMETERS AND OPERATING CONDITIONS; AND
(3) AN ANALYSIS OF THE ELECTRON GUN REGION, WITH
EMPHASIS ON VELOCITY SPREAD AND CURRENT DENSITY
EFFECTS. THE RESULTS OF A DETAILED EXPERIMENTAL
ANALYSIS OF THE TWP ARE PRESENTED, PROVIDING BOTH
VERIFICATION OF THE MORE COMPLETE THEORETICAL
TREATMENT AND INFORMATION ON GENERALLY-USEFUL
PHOTODETECTOR TEST TECHNIQUES. EXPERIMENTAL DATA
ARE GIVEN ON SEVERAL OTHER TYPES OF PHOTODETECTORS.

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-605 512

SYLVANIA ELECTRONIC SYSTEMS-WEST MOUNTAIN VIEW CALIF
ELECTRONIC DEFENSE LABS

RESEARCH ON TECHNIQUES FOR LIGHT MODULATION
DETECTION; PART II: FREQUENCY DEMODULATORS.

(U)

DESCRIPTIVE NOTE: FINAL REPT. 15 MAY 63-15 MAY 64,

JUN 64 256P

AMMANN, F. O. ; HARRIS, S. E. ;

TARG, R. ;

CONTRACT: AF 33(657)-8995, AF 04(695)-305

PROJ: AF-4156

TASK: 415610

MONITOR: AFAL TDR-64-181-P2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: STUDY MADE IN COOPERATION WITH
STANFORD UNIV. UNDER CONTRACT TO AIR FORCE SYSTEMS
COMMAND. SEE ALSO AD-605 478.

DESCRIPTORS: (*LIGHT, DEMODULATION), (*FREQUENCY
MODULATION, LIGHT), (*PHASE MODULATION, LIGHT),
(*PHOTOTUBES, MICROWAVE EQUIPMENT), LIGHT COMMUNICATION
SYSTEMS, REFRACTION, DISCRIMINATORS, MICROWAVE
FREQUENCY, DEMODULATORS, CRYSTALS, NOISE (RADIO),
SIGNAL-TO-NOISE RATIO, LASERS, BROADBAND, DESIGN,
CONSTRUCTION, TESTS

(U)

IDENTIFIERS: BIREFRINGENT DISCRIMINATORS, OPTICAL
RATIO DETECTORS, HETERODYNE DETECTION

(U)

THE RESULTS OF A ONE-YEAR PROGRAM ON THE
DEMODULATION OF FREQUENCY-MODULATED (FM) OR PHASE-
MODULATED (PM) LIGHT ARE PRESENTED. THEORETICAL
AND EXPERIMENTAL STUDIES WERE MADE BOTH OF DIRECT
DEMODULATION AND HETERODYNE DEMODULATION. A
TECHNIQUE EMPLOYING CONVERSION OF FM TO AM VIA A
BIREFRINGENT DEVICE WITH SUBSEQUENT DETECTION BY A
TRAVELING-WAVE PHOTOTUBE IS USED FOR THE DEMODULATION
METHOD. THE REPORT DEALS WITH TECHNIQUES AND
DEVICES FOR CONVERTING FM (AND PM) TO AM AT
OPTICAL FREQUENCIES. COMPREHENSIVE ANALYSES AND
DISCUSSIONS ARE GIVEN ON TWO SIMPLE BIREFRINGENT
DEVICES, THE BIREFRINGENT DISCRIMINATOR AND THE
OPTICAL RATIO DETECTOR, DEVICES CAPABLE OF CONVERTING
FM TO AM AND PM TO AM, RESPECTIVELY. THE
USE OF MULTICRYSTAL DEVICES IN DEMODULATORS IS
TREATED. INCLUDED ARE TWO OPTICAL NETWORK
SYNTHESIS TECHNIQUES FOR REALIZING BIREFRINGENT
DEVICES HAVING ARBITRARILY SPECIFIED TRANSFER
FUNCTIONS.

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-605 940

UNITED AIRCRAFT CORP EAST HARTFORD CONN

ULTRASONIC CONTROL OF LASER PERFORMANCE. (U)

DESCRIPTIVE NOTE: FINAL REPT. FOR 26 JUN 63-25 JUN 64,

SEP 64 64P DEMARIA, A. J. DANIELSON, G.

E. JR.;

REPT. NO. UNAIR-C-920083-12

CONTRACT: DA19 020AMC0170A

PROJ: IG6 22001A056 03 17

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*MODULATION, LASERS), (*LASERS, CONTROL),
(*ULTRASONIC RADIATION, LASERS), GLASS, IMPURITIES,
NEODYMIUM, REFRACTIVE INDEX, MECHANICAL WAVES, FEEDBACK,
TUNNELING (ELECTRONICS), STANDING WAVE RATIOS,
PERFORMANCE (ENGINEERING) (U)

THE REPORT DESCRIBES THE WORK PERFORMED ON A RESEARCH PROGRAM DIRECTED TOWARD DETERMINING THE OSCILLATION CHARACTERISTICS OF A LASER WHEN THE REFRACTIVE INDEX WITHIN THE FEEDBACK CAVITY IS PERTURBED BY MEANS OF ACOUSTIC, ELECTRIC, OR MAGNETIC FIELDS. THE LASER IS REPRESENTED IN TERMS OF A SYSTEM BLOCK DIAGRAM HAVING FORWARD AND FEEDBACK TRANSFER FUNCTIONS WHICH CAN BE VARIED IN A PERIODIC MANNER SO AS TO MODULATE THE OUTPUT OF THE QUANTUM DEVICE. THE MODIFICATION OF A LASER'S FEEDBACK TRANSFER FUNCTION BY AN ULTRASONIC-REFRACTION AND BY AN OPTICAL-TUNNELING SHUTTER HAS BEEN UTILIZED TO GATE THE LASER'S OUTPUT. EXPERIMENTS ARE REPORTED WHICH DEMONSTRATE THAT THE PERIODIC FLUCTUATION OF THE REFRACTIVE INDEX RESULTING FROM THE PROPAGATION OF FOCUSED ULTRASONIC ENERGY WITHIN A SOLID STATE LASER MEDIUM CAN BE UTILIZED AS A Q-SPOILER TO GATE THE OUTPUT OF HIGH GAIN LASERS WITHOUT THE INTRODUCTION OF LOSSY ELEMENTS INTO THE LASER'S FEEDBACK PATH. IN ADDITION, EXPERIMENTS ARE REPORTED WHICH REVEAL AN INCREASE IN THE ENERGY OUTPUT OF A NEODYMIUM DOPED LANTHANUM THORIUM BORATE GLASS ROD WHEN LONGITUDINAL ACOUSTICAL STANDING WAVES WERE PROPAGATED DOWN THE LENGTH OF THE GLASS ROD. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-606 219

STANFORD UNIV CALIF MICROWAVE LAB

PHOTOMIXING IN A BULK SEMICONDUCTOR
PHOTODETECTOR.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
AUG 64 75P WEAVER, J. N. ;
REPT. NO. ML-1206
CONTRACT: NONR-225(48), NSF-G-22929
PROJ: NR373 361

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SUPPORTED IN PART BY THE U. S. ARMY
SIGNAL CORPS AND U. S. AIR FORCE.

DESCRIPTORS: (*LIGHT, DEMODULATION), (*DEMODULATORS,
LIGHT), (*SEMICONDUCTOR DEVICES, CRYSTAL MIXERS),
(*PHOTOELECTRIC CELLS (SEMICONDUCTOR),
PHOTOCONDUCTIVITY), SINGLE CRYSTALS, LASERS, MICROWAVE
FREQUENCY, PHOTOELECTRIC EFFECT, ELECTRICAL PROPERTIES,
VOLTAGE, ELECTRIC CURRENTS, THEORY, MATHEMATICAL
ANALYSIS, EXPERIMENTAL DATA, DESIGN, CADMIUM ALLOYS,
SELENIUM ALLOYS, SILICON, GALLIUM ALLOYS, ARSENIC
ALLOYS (U)
IDENTIFIERS: SEMICONDUCTOR PHOTODETECTORS (U)

THIS STUDY IS CONCERNED WITH BULK SEMICONDUCTORS AS
DETECTORS OF THE DIFFERENCE FREQUENCY BETWEEN TWO OR
MORE OPTICAL SIGNALS AND AS A DEMODULATOR OF
MICROWAVE AM MODULATED LIGHT. THE BASIC
EXPERIMENT CONSISTED OF MOUNTING SINGLE CRYSTALS OF
CDSE, SI, AND GAAS IN A COAXIAL MOUNT AND
ILLUMINATING THE CRYSTALS WITH THE BEAM OF SINGLE
LASER. A DC BIAS VOLTAGE WAS APPLIED AND THE
MICROWAVE AND DC PHOTOCURRENTS WERE MEASURED AS A
FUNCTION OF LIGHT INTENSITY, BIAS VOLTAGE,
TEMPERATURE, MICROWAVE MATCH, AND THE VARIOUS CRYSTAL
SAMPLES. SOME OF THE EXPERIMENTAL PROBLEMS
ENCOUNTERED ARE DISCUSSED. AN OUTLINE OF THE
PERTINENT, SIMPLIFIED PHOTOCONDUCTOR THEORY IS
PRESENTED ALONG WITH AN EQUIVALENT CIRCUIT FOR THE
PHOTODETECTOR DEVICE. ALSO, THE SEMICONDUCTOR
CAPTURE CROSS SECTION, LIFETIME, AND TRAP DENSITY IS
CALCULATED FROM THE MEASURED VALUES OF PHOTOCURRENT.
THE BULK SEMICONDUCTOR PHOTODETECTOR IS SHOWN TO BE
A RUGGED, SIMPLE, AND INEXPENSIVE DEVICE FOR
DETECTING OPTICAL BEAT FREQUENCIES, PARTICULARLY AT
HIGH LIGHT LEVELS AND IN THE INFRARED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-607 487

NAVAL RESEARCH LAB WASHINGTON D C

EXPERIMENTAL OBSERVATIONS OF FORWARD SCATTERING OF
LIGHT IN THE LOWER ATMOSPHERE. (U)

DESCRIPTIVE NOTE: INTERIM REPT.,

SEP 64 50P CURCIO, J. A. DRUMMETTER, L. F.

.JR.]

REPT. NO. NRL-6152

PROJ: RR004 02 42 5152

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT TRANSMISSION, SCATTERING),
(*ATMOSPHERE, LIGHT TRANSMISSION), (*LIGHT,
PROPAGATION), AEROSOLS, COMMUNICATION SYSTEMS, LASERS,
AIR POLLUTION, RUBY (U)

THE REPORT DEALS IN PART WITH THE EXPERIMENTAL
RESULTS FROM SEVEN MEASUREMENTS ON THE FORWARD
SCATTERING OF LIGHT BY THE ATMOSPHERIC AEROSOL. IN
ADDITION, CONSIDERATIONS OF THE PROBLEM OF DETECTING
FORWARD SCATTERED LIGHT IN THE DAYTIME SHOW THAT
ESTIMATED RESULTS AGREE WITH THE AVAILABLE
EXPERIMENTAL DATA. CONSIDERATIONS OF THE
FEASIBILITY OF USING OVER-THE-HORIZON PROPAGATION AS
A COMMUNICATIONS LINK LEADS TO THE ESTIMATION THAT
COMMUNICATION BETWEEN FIXED POINTS AT MORSE CODE
RATES IS CURRENTLY FEASIBLE OVER RANGES OF THE ORDER
OF 50 KM IN THE DAYTIME FOR METEOROLOGICAL RANGES OF
16 KM OR MORE, USING A NARROW-BEAM PROJECTOR AS
SOURCE. SHIP-TO-SHIP COMMUNICATION WOULD REQUIRE
SOURCES OF VERY HIGH POWER OR PRECISE STABILIZATION
AND POINTING OF EXISTING HIGH-INTENSITY SEARCHLIGHT
SOURCES. (AUTHOR) (U)

UNCLASSIFIED

DNC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-607 852

STANFORD UNIV CALIF STANFORD ELECTRONICS LABS

TUNING OF CW LASERS OVER ANGSTROM BANDWIDTHS: SOME
POSSIBLE APPROACHES. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. FOR JUN 63-JUN 64,

AUG 64 62P MORRIS, R. J. ;

REPT. NO. SEL-64-092 ,SEL-TR-0576-6

CONTRACT: AF 33(657)-11144

PROJ: AF-4036

TASK: 403602

MONITOR: AFAL TDR-64-227

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, TUNED AMPLIFIERS), (*TUNED
AMPLIFIERS, LASERS), TUNING DEVICES, SIGNALS, FREQUENCY
SHIFT, DIFFRACTION, SOUND, CRYSTALS, MAGNETIC FIELDS,
DOPPLER EFFECT, TEMPERATURE, PARTICLE BEAMS, FREQUENCY
MODULATION, MICROWAVE FREQUENCY (U)

THIS REPORT IS AN INVESTIGATION OF SEVERAL
APPROACHES TO THE PROBLEM OF OBTAINING CW COHERENT
OPTICAL SIGNALS WHOSE WAVELENGTH CAN BE SCANNED IN A
CONTROLLED FASHION OVER A RANGE OF APPROXIMATELY 1
A OR MORE. THE METHODS DISCUSSED INCLUDE THE
FOLLOWING INTERNAL TUNING METHODS: ZEEMAN TUNING;
DIFFRACTION FROM ACOUSTIC WAVES; CRYSTAL STRAIN
TUNING; THERMAL TUNING; TUNABLE MODE SELECTION IN
WIDE LINES; AND DOPPLER-SHIFT TUNING USING A BEAM
OF ACCELERATED PARTICLES. THE LAST METHOD LISTED
IS BELIEVED TO BE A NOVEL SCHEME FOR LASER TUNING.
FREQUENCY MODULATION USING MICROWAVE FREQUENCIES
AND LARGE MODULATION INDICES IS ALSO DISCUSSED AS AN
EXTERNAL TUNING METHOD. OF ALL THE APPROACHES, IT
IS PROBABLY THE ONE THAT WILL PROVIDE THE SIMPLEST
AND MOST EFFECTIVE SOLUTION. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-608 817

ARMY ELECTRONICS LABS FORT MONMOUTH N J

PULSE MODULATION OF AN ELECTRON INJECTION LASER
TRANSMISSION SYSTEM,

(U)

52 3P SCHIEL, F. J. ; BULLWINKEL, E. C. ;
GAMMARINO, R. R. ; ARMARA, J. F. ; WEBB, R. E. ;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS, LASERS),
(*LASERS, LIGHT COMMUNICATION SYSTEMS), (*COMMUNICATION
SYSTEMS, LASERS), TURBULENCE, DISTORTION,
AUDIOFREQUENCY, PULSE MODULATION, FOURIER ANALYSIS,
DESIGN, SIGNAL-TO-NOISE RATIO, LIGHT TRANSMISSION,
GASES, HELIUM, NEON (U)
IDENTIFIERS: ELECTRON INJECTION LASERS (U)

AMPLITUDE MODULATION OF GAS LASERS IN CW
OPERATION ARE EASILY ACHIEVABLE IN THE AUDIO
FREQUENCY RANGE EITHER BY MODULATION OF THE RF PUMP
POWER OR BY ELECTRO-OPTICAL OR PIEZOELECTRIC
MODULATORS. IN INITIAL EXPERIMENTS A HE-NE GAS
LASER (SPECTRA PHYSICS NR. 112) WITH
HEMISPHERICAL RESONATOR ARRANGEMENT EMITTING AT 6328
WAS EMPLOYED. PUMP MODULATION ALLOWED A MODULATION
DEPTH OF THE EMITTED COHERENT RADIATION OF 100%
WITH AN AVERAGE POWER OUTPUT OF THREE MILLIWATTS.
THE LIGHT SIGNAL WAS COLLECTED IN A 4 FOOT
TELESCOPE (QUESTAR) AND RECEIVED BY AN RCA 7265
PHOTOMULTIPLIER. THIS EXPERIMENTAL SYSTEM WAS USED
FOR THE TRANSMISSION OF ONE AUDIO CHANNEL. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-609 846

AIR FORCE CAMBRIDGE RESEARCH LABS L G HANSCOM FIELD
MASS

APPLICATIONS OF LASERS.

(U)

DESCRIPTIVE NOTE: SPECIAL REPORTS,

NOV 64 43P STICKLEY, C. MARTIN ;

PROJ: 4645

MONITOR: AFCRL , AFCRL 64-914, SR15

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: A SHORTER VERSION OF A PAPER PREPARED
FOR A SEMINAR ON LASERS HELD IN AUGUST 1964 AT NEW
YORK CITY UNDER THE SPONSORSHIP OF THE EDUCATION AND
RESEARCH ASSOCIATION.

DESCRIPTORS: (*LASERS, SYMPOSIA), INSTRUMENTATION,
COMMUNICATION SYSTEMS, SPACE COMMUNICATION SYSTEMS,
METALLURGY, MACHINING, MEDICAL RESEARCH, BIOLOGY,
RETINA, RUBY, TRACKING, ACOUSTICS, ROMAN SPECTROSCOPY,
ELECTRON OPTICS, COMPUTERS, PHOTOGRAPHY, DEFENSE
SYSTEMS

(U)

FUNDAMENTALLY THIS ARTICLE IS A SURVEY OF
APPLICATIONS OF LASERS. THE APPLICATIONS ARE
DIVIDED INTO SIX MAJOR AREAS: PRECISION
MEASUREMENTS, COMMUNICATIONS, BIOLOGICAL AND MEDICAL,
OTHER SCIENTIFIC AREAS, METALWORKING, AND
MISCELLANEOUS. A TABLE OF THE BASIC
CHARACTERISTICS OF THE MAJOR TYPES OF LASERS IS
PROVIDED SO THAT THE USER CAN BE MADE AWARE OF THE
LIMITATIONS AND CAPABILITIES OF LASERS. GOOD
EXAMPLES OF APPLICATIONS IN EACH OF THESE AREAS ARE
DESCRIBED IN SOME DETAIL TO ILLUSTRATE WHICH MAJOR
PROPERTIES OF LASER RADIATION ARE USEFUL IN THAT
PARTICULAR AREA. MOST OF THE DISCUSSION PERTAINS
TO PRESENT-DAY APPLICATIONS BUT IN SOME INSTANCES
WHAT APPEAR TO BE GOOD FUTURE APPLICATIONS ARE ALSO
DESCRIBED. SEVENTY-TWO REFERENCES TO THE TECHNICAL
LITERATURE THAT RELATE TO APPLICATIONS ARE PROVIDED.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-610 071

NAVAL ORDNANCE LAB WHITE OAK MD

TRANSMISSION OF GREEN LASER LIGHT (5300 Å) THROUGH WATER, (U)

SEP 64 29P MATLACK, D. F.; TEMPLIN, H. A.;
TALBERT, W. W.;
REPT. NO. NOLTR-64-179
TASK: RUDC48000 212 1F001 05 02

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LIGHT TRANSMISSION, WATER), (*LASERS, LIGHT TRANSMISSION), (*WATER, LIGHT TRANSMISSION), NEODYMIUM, LIGHT, COLORS, ELECTROMAGNETIC WAVES, PROPAGATION, LIQUIDS, ATTENUATION, UNDERWATER COMMUNICATION SYSTEMS, MEASUREMENT, TEST METHODS, TEST EQUIPMENT, OPTICAL EQUIPMENT, NAVAL RESEARCH LABORATORIES, OPTICS, RANGE FINDING, UNDERWATER (U)

THE EXTINCTION COEFFICIENT OF FILTERED POTOMAC RIVER WATER WAS MEASURED AT THE FREQUENCY DOUBLED NEODYMIUM 'GREEN LASER' WAVELENGTH OF 5300 Å. MEASUREMENTS WERE CONDUCTED IN SITU AT THE DAVID TAYLOR MODEL BASIN (DTMB) IN A COOPERATIVE PROGRAM WITH THE NAVAL RESEARCH LABORATORY (NRL). EXTINCTION COEFFICIENTS OF 0.097, 0.104 AND 0.119/M WERE MEASURED ON 4, 5 AND 8 JUNE 1964, RESPECTIVELY. THE INCREASE IN ATTENUATION WITH TIME IS CONFIRMED BY FILTERED ARC LIGHT MEASUREMENTS MADE BY THE NRL AND IS ATTRIBUTED TO CONTAMINATION OF THE WATER AFTER THE BASIN FILTRATION SYSTEM WAS TURNED OFF. SCATTERING EXPERIMENTS INDICATE THAT THE AUREOLE EFFECT FOR THE HIGHLY COLLIMATED LASER BEAM WAS SMALL OVER THE 200 METER RANGE OF THE MEASUREMENTS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-610 130

LIBRARY OF CONGRESS WASHINGTON D C AEROSPACE TECHNOLOGY
DIV

ELECTROMAGNETIC LIGHT WAVES IN COMMUNICATION
ENGINEERING,

(U)

JAN 65 17P PROCHAZKA, MIROSLAV ;
REPT. NO. ATD-T-65-2
MONITOR: TT , 65 60830

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SVETELNE ELEKTROMAGNETICKE
VLENENIVE SDELOVACI TECHNIKE, TRANS. OF SLABOPROUDY
OBZOR (CZECHOSLOVAKIA) 1964, V. 25, NO. 6, P. 313-318.

DESCRIPTORS: (*COMMUNICATION THEORY, LIGHT COMMUNICATION
SYSTEMS), (*LIGHT COMMUNICATION SYSTEMS, COMMUNICATION
THEORY), (*ELECTROMAGNETIC WAVES, PROPAGATION),
(*LASERS, LIGHT COMMUNICATION SYSTEMS), WAVE
TRANSMISSION, LIGHT, MODULATION, OSCILLATION,
DEMODULATORS, RADIO WAVES, QUANTUM MECHANICS, OPTICS,
ELECTRIC CURRENTS, SIGNAL-TO-NOISE RATIO, ATMOSPHERE,
METEOROLOGICAL PARAMETERS (U)

BASIC QUESTIONS RELATED TO THE USE OF LIGHT WAVES
FOR TRANSMISSION OF INFORMATION ARE TREATED. THE
GENERATION OF LIGHT WAVES, THEIR MODULATION, AND
DETECTION ARE COVERED. MAIN EMPHASIS IS PLACED ON
THE TRANSMISSION OF INFORMATION IN THE ATMOSPHERE
UNDER NORMAL METEOROLOGICAL CONDITIONS AND BY MEANS
OF LIGHT GUIDES. THE POSSIBILITY OF USING LIGHT
WAVES FOR INFORMATION TRANSMISSION IN THE NEAR FUTURE
IS CRITICALLY EVALUATED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-610 422

DELAWARE UNIV NEWARK

QUANTUM LIMITATIONS TO ELECTROMAGNETIC SIGNAL
MEASUREMENTS.

(U)

DESCRIPTIVE NOTE: FINAL REPT. FOR 1 JAN 63-31 DEC 64.

DEC 64 15P BOLGIANO, L. PAUL, JR.:

CONTRACT: AF AFOSR2.63

MONITOR: AFOSR, 65 0028

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*COMMUNICATION THEORY, QUANTUM MECHANICS),

(*PHOTOELECTRIC EFFECT, COMMUNICATION THEORY),

ELECTROMAGNETIC WAVES, COMMUNICATION SYSTEMS,

ILLUMINATION, LIGHT, SIGNALS, NARROWBAND, FOURIER

ANALYSIS, PROBABILITY, STATISTICAL ANALYSIS

(U)

IDENTIFIERS: OPTICAL COMMUNICATION SYSTEMS,

PHOTODETECTION

(U)

IT WAS FOUND POSSIBLE TO DEVELOP A MATHEMATICAL
THEORY OF COMMUNICATION WHICH INCLUDES QUANTUM
EFFECTS, AND AS IS ALSO IMPORTANT, REDUCES TO THE
MATHEMATICS OF CLASSICAL COMMUNICATION THEORY WHEN
QUANTUM EFFECTS CAN BE NEGLECTED. BECAUSE
PHOTOELECTRIC DETECTION IS USED UNIVERSALLY AT
OPTICAL FREQUENCIES, AND BECAUSE IT LENDS ITSELF TO A
SIMPLER THEORETICAL DESCRIPTION, EARLIER PUBLICATIONS
HAVE CONSIDERED THE STATISTICS OF PHOTO DETECTION -
HOW THEY DIFFER FOR COHERENT AND INCOHERENT SIGNALS,
AND THE CONSEQUENCES OF THESE DIFFERENCES FOR
INFORMATION TRANSMISSION. THE WORK WAS
CONCENTRATED IN TWO MAJOR AREAS: (A) STATISTICS
OF PHOTODETECTION, AND (B) QUANTUM STATISTICAL
ANALYSIS OF COMMUNICATION.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-612 725

PERKIN-ELMER CORP NORWALK CONN

INVESTIGATION OF TECHNIQUES FOR MODULATING AND
SCANNING A LASER BEAM TO FORM A VISUAL DISPLAY. (U)

DESCRIPTIVE NOTE: FINAL REPT. FOR JUN 63-JUN 64,

JAN 65 353P YODER, PAUL R. ;

REPT. NO. ER-7600

CONTRACT: AF30 602 3122

PROJ: 5578

TASK: 557803

MONITOR: RADC , TDR-64-365

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, DISPLAY SYSTEMS), (*DISPLAY
SYSTEMS, LASERS), (*ELECTRON OPTICS, LASERS), LIGHT,
VIDEO SIGNALS, MODULATION, DEFLECTION, MODULATORS,
CRYSTALS, POTASSIUM COMPOUNDS, HYDROGEN COMPOUNDS,
PHOSPHATES, OPTICAL SCANNING, MIRRORS, BARIUM COMPOUNDS,
TITANATES, SYNCHRONIZATION (ELECTRONICS), LIGHT
COMMUNICATION SYSTEMS (U)

VARIOUS TECHNIQUES WHICH MIGHT BE USED TO MODULATE
AND DEFLECT A LASER BEAM IN RESPONSE TO AN INPUT
VIDEO SIGNAL SO AS TO FORM A PROJECTED VISUAL DISPLAY
CONTAINING 1,000,000 RESOLVED INFORMATION BITS AT 30
FRAMES PER SECOND ARE CONSIDERED IN THIS REPORT.
ELECTRO-OPTICAL MODULATION TECHNIQUES ARE EVALUATED
IN GENERAL AND THE POCKEL CELL USING POTASSIUM
DIHYDROGEN PHOSPHATE IS CONSIDERED IN DETAIL. SLOW
SCANNING OF THE BEAM AT 30 CYCLES PER SECOND IS FOUND
TO BE FEASIBLE USING A PIEZOELECTRICALLY DRIVEN
NODDING MIRROR SCANNER. SEVERAL FAST SCANNING
TECHNIQUES ARE INVESTIGATED THEORETICALLY AND ONE
TYPE DEVICE USING A PRISM OF BARIUM TITANATE ELECTRO-
OPTICALLY ACTIVE CRYSTALLINE MATERIAL IS ALSO
EVALUATED EXPERIMENTALLY. BRIEF CONSIDERATION OF
PHOTOMETRIC AND SYNCHRONIZATION ASPECTS OF LASER
DISPLAY SYSTEMS INDICATES NO PARTICULAR PROBLEM AREAS
TO BE RESOLVED IN DEVELOPMENT OF ACTUAL HARDWARE
SYSTEMS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /Z LW13

AD-614 042

LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF

TECHNICAL PROGRESS ON FUNDAMENTAL AND APPLIED
RESEARCH PROGRAMS.

(U)

DESCRIPTIVE NOTE: PROGRESS REPT. FOR JAN-MAR65.

MAR 65 293P

REPT. NO. 6-75-65-10

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, SCIENTIFIC RESEARCH),
(*DOCUMENTATION, SCIENTIFIC RESEARCH), (*ELECTRONICS,
SCIENTIFIC RESEARCH), (*PHYSICS, SCIENTIFIC RESEARCH),
REPORTS, ELECTRONS, SCATTERING, PLASMA PHYSICS,
ELECTROMAGNETIC WAVES, PROPAGATION, SOLID STATE PHYSICS,
CESIUM, CRYSTALS, EXCITATION, SEMICONDUCTORS,
SPECTROSCOPY, QUANTUM MECHANICS, MAGNETIC MATERIALS,
FERROMAGNETIC MATERIALS, SUPERCONDUCTIVITY, MAGNETIC
TAPE, LIQUIDS, INFORMATION RETRIEVAL, STORAGE TUBES,
DISPLAY SYSTEMS, ELECTRONICS LABORATORIES, COMMUNICATION
THEORY (U)

CONTENTS: PHYSICAL ELECTRONICS, SOLID STATE
PHYSICS, LIQUID STATE PHYSICS, INFORMATION
SCIENCES, LASERS AND COMMUNICATION THEORY. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-614 870

F MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

X-BAND MODULATION OF GAAS LASERS, (U)

DEC 64 1P GOLDSTEIN, B. S. ; WEIGAND, R. M. ;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PUB. IN PROCEEDINGS OF THE IEEE
V53 N2 P195 FEB 1965 (COPIES NOT AVAILABLE TO DDC OR
CLEARINGHOUSE CUSTOMERS).

DESCRIPTORS: (*LASERS, AMPLITUDE MODULATION), X BAND,
DIODES (SEMICONDUCTOR), GALLIUM ALLOYS, ARSENIC ALLOYS,
INJECTION, TRAVELING-WAVE TUBES, COUPLING CIRCUITS,
RADIOFREQUENCY POWER (U)

THIS CORRESPONDENCE REPORTS CW AMPLITUDE
MODULATION OF GAAS INJECTION LASERS AT X BAND.
THE HIGHEST MODULATION FREQUENCY WAS 11 GC/S, A
LIMIT IMPOSED BY COMPONENTS OF THE EXPERIMENTAL
SETUP. THE X-BAND MODULATING SIGNAL IS AMPLIFIED
IN A TRAVELING-WAVE AMPLIFIER AND COUPLED TO THE
LASER. TWO DIRECTIONAL COUPLERS MONITOR THE
FORWARD AND REFLECTED RF POWER. THE RF POWER
IS COUPLED TO THE LASER IN A WAVEGUIDE STRUCTURE.
IN THIS STRUCTURE, THE COPPER FINS ACT AS A SHORT
CIRCUIT TO THE X-BAND POWER WHILE THE MODULATED
INFRARED RADIATION PASSES UNAFFECTED (NEGLECTING
SOME BLOCKAGE). THE LASER, LOCATED BETWEEN TWO
SECTIONS OF A COPPER POST, IS SPACED A HALF GUIDE
WAVELENGTH (AT 9.1 GC/S) FROM THE RF
SHORTCIRCUITING FINS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-617 717

NAVAL ORDNANCE TEST STATION CHINA LAKE CALIF

FABRY-PEROT TYPE LASER MODULATORS.

(U)

DESCRIPTIVE NOTE: TECHNICAL PROGRESS REPT. FOR JUL 63-
JUL 64;

APR 65 45P MCCAULEY, DONALD G. ;
REPT. NO. TPR-386 ;NOTS-TP-3736
MONITOR: IDEP 461.85.00.00-X7-06

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, MODULATORS), (*MODULATORS,
LASERS), (*INTERFEROMETERS, LASERS), (*LIGHT
COMMUNICATION SYSTEMS, LASERS), PIEZOELECTRIC
EFFECT, OSCILLATION, QUARTZ, POTASSIUM COMPOUNDS,
PHOSPHATES, COMMUNICATION SATELLITES(PASSIVE),
CRYSTAL STRUCTURE, REFRACTIVE INDEX

(U)

IDENTIFIERS: ELECTRO-OPTIC EFFECT, FABRY-PEROT
MODULATORS, POTASSIUM DIHYDROPHOSPHATE

(U)

THIS REPORT DESCRIBES THE OPTICAL CHARACTERISTICS
OF TWO PROTOTYPE LASER MODULATORS HAVING THE THIN,
FLAT, DISK-SHAPED FABRY-PEROT (F-P)
INTERFEROMETER DESIGN. THE MODULATORS ARE BEING
USED TO INVESTIGATE THE USE OF LASER RADIATION IN
COMMUNICATIONS. THE REPORT DISCUSSES THE INTENSITY
MODULATION RESULTING BOTH FROM THE
CONVERSE PIEZOELECTRICALLY-INDUCED OSCILLATIONS IN THE
PHYSICAL SEPARATION OF THE INTERFEROMETER REFLECTORS
AND FROM THE ELECTROOPTICALLY-INDUCED OSCILLATIONS IN
THE OPTICAL SEPARATION OF THE INTERFEROMETER
REFLECTORS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-618 297

NORTHEASTERN UNIV BOSTON MASS

RESEARCH ON STORAGE DIODE LASERS.

(U)

DESCRIPTIVE NOTE: FINAL TECHNICAL SUMMARY REPT. FOR 1

APR 63-15 MAY 64,

MAY 64 2P

SEED, RICHARD G. HERGENROTHER,

KARL . ;

CONTRACT: NONR410602

PROJ: ARPA ORDER 306 62

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, DIODES(SEMICONDUCTOR)),

(*DIODES(SEMICONDUCTOR), LASERS), CIRCUITS,

DESIGN, EFFECTIVENESS, CONFIGURATION,

CRYOGENICS, RANGE FINDING, LIGHT COMMUNICATION

SYSTEMS, LIGHT PULSES, GALLIUM COMPOUNDS,

ARSENIDES, GERMANIUM, SILICON

(U)

IDENTIFIERS: STORAGE DIODE LASERS

(U)

RESEARCH ON A PROPOSED STORAGE DIODE LASER IS DESCRIBED. THE OBJECTIVES ARE (1) COMPLETION OF DESIGN THEORY (2) BASIC PARAMETER MEASUREMENTS (3) EXPERIMENTAL PROOF (4) FABRICATION OF EFFECTIVE DEVICES. THE DESIRABILITY OF SUCH A DEVICE IN MANY POTENTIAL APPLICATIONS IS DISCUSSED. THE DESIGN THEORY IS PRESENTED IN DETAIL. FOUR POSSIBLE STORAGE DIODE LASER CONFIGURATIONS ARE DESCRIBED, OF WHICH THE MOST PROMISING INVOLVES A LOW CURRENT STORAGE PULSE AND HIGH CURRENT TRIGGER PULSE IN A LONG LIFETIME MATERIAL. THE POSSIBILITY OF OBTAINING LONG LIFETIME BY THE SHIFT FROM DIRECT TO INDIRECT TRANSITION IS DISCUSSED. NEGATIVE EXPERIMENTAL RESULTS WITH EXTREME HIGH CURRENT PULSES IN GERMANIUM AND SILICON ARE PRESENTED. REVERSE EMISSION OF GALLIUM ARSENIDE AND THE SHIFT OF THE ABSORPTION EDGE IN GERMANIUM ARE DESCRIBED. THE DESIGN OF DIODE LASER PULSERS IS REVIEWED IN GENERAL. THREE SPECIFIC CIRCUIT CONFIGURATIONS ARE PRESENTED. AN ELECTRICAL DOUBLE PULSER IS DESCRIBED. THE TECHNOLOGY OF IMAGE CONVERTERS AND COOLERS USED IS DESCRIBED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-621 053

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

OPTICAL COMMUNICATIONS;

(U)

JUN 65 11P CHIA-SUNG, LIU ;
REPT. NO. FTD-TT-65-95
MONITOR: TT , 65-63953

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF K'IO HSUEH TA
CHUNG (CHINESE PEOPLE'S REPUBLIC) N2 P46-7, 64
1964.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS, LASERS),
(*LASERS, LIGHT COMMUNICATION SYSTEMS), AMPLITUDE
MODULATION, WAVEGUIDES, PHOTOMULTIPLIERS, CHINA,
THEORY

(U)

A GENERAL DESCRIPTION OF THE THEORY AND
APPLICATIONS OF OPTICAL COMMUNICATION SYSTEMS IS
PRESENTED.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-621 114

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

SEMICONDUCTOR LASERS.

(U)

DESCRIPTIVE NOTE: MEETING SPEECH:

MAY 65 12P LAX, BENJAMIN ;

REPT. NO. MS-779E

CONTRACT: AF19 628 5167

MONITOR: ESD , TDR-65-319

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PUB. IN ANNALS OF THE NEW YORK
ACADEMY OF SCIENCES, V122 ARTICLE2 P598-607 MAY 28
1965 (COPIES NOT AVAILABLE TO DDC OR CLEARINGHOUSE
CUSTOMERS).

DESCRIPTORS: (*LASERS, DIODES(SEMICONDUCTORS)),
(*DIODES(SEMICONDUCTOR), LASERS), SEMICONDUCTOR
DEVICES, GALLIUM ALLOYS, ARSENIC ALLOYS, MAGNETIC
PROPERTIES, LIGHT COMMUNICATION SYSTEMS, INFRARED
EQUIPMENT, RADAR EQUIPMENT

(U)

IDENTIFIERS: GALLIUM ARSENIDES

(U)

SEMICONDUCTOR LASERS ARE THE MOST RECENT ADDITIONS
TO THE GROWING FAMILY OF THESE NEW COHERENT SOURCES
OF LIGHT. ALTHOUGH THEIR CONCEPTION IS ALMOST TEN
YEARS OLD, THE TECHNOLOGY WAS NOT SUFFICIENTLY
ADVANCED UNTIL TWO YEARS AGO WHEN HIGHLY EFFICIENT
LUMINESCENT DIODES OF GALLIUM ARSENIDE WERE
DISCOVERED. THE DEVELOPMENT OF THE LASER ITSELF BY
THE GROUPS AT GENERAL ELECTRIC, IBM, AND
LINCOLN LABORATORY SHORTLY AFTERWARDS WAS READILY
FORESEEN. TODAY THE PREOCCUPATION OF MANY
INDUSTRIAL, UNIVERSITY, AND GOVERNMENT LABORATORIES
WITH RESEARCH AND DEVELOPMENT HAS GIVEN RISE TO MANY
PUBLICATIONS, WHICH INDICATE A LIVELY INTEREST AND
PROMISING FUTURE FOR THESE DEVICES. THE ACTIVITY
IS WELL BALANCED BETWEEN THE BASIC PHYSICS AND THE
APPLIED. (AUTHOR)

(U)

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-621 204

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

PROPERTIES OF THE PBSE DIODE LASER,

(U)

JAN 65 4P BUTLER, JACK F. ; CALAWA,
ARTHUR R. ; REDIKER, ROBERT H. ;
REPT. NO. JA-2517
CONTRACT: AF19 628 5167
MONITOR: ESD , TDR-65-430

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PUB. IN IEEE JOURNAL OF QUANTUM
ELECTRONICS, VQF-1 N1 P4-7 APR 1965. (COPIES NOT
AVAILABLE TO DDC OR CLEARINGHOUSE CUSTOMERS).

DESCRIPTORS: (*LASERS, DIODES(SEMICONDUCTOR)),
(*DIODES(SEMICONDUCTOR), LASERS), (*LEAD ALLOYS,
SELENIUM ALLOYS), INFRARED COMMUNICATION SYSTEMS,
INFRARED WINDOWS, HAZE, ATTENUATION, CRYSTAL
STRUCTURE, HEAT TREATMENT, INFRARED SPECTROSCOPY (U)

DIODE LASER ACTION HAS BEEN OBTAINED AT 8.5 MICRONS
WITH PBSE. THIS LASER IS OF POTENTIAL INTEREST
FOR TERRESTRIAL COMMUNICATIONS SINCE ITS EMISSION IS
IN THE 8-TO-14MICRONS ATMOSPHERIC WINDOW, A SPECTRAL
REGION OF HIGH ATMOSPHERIC TRANSPARENCY WHERE
ATTENUATION DUE TO SCATTERING BY HAZE IS LOW.
FABRICATION TECHNIQUES ARE DESCRIBED WHICH ARE
BASED ON CONTROLLING CARRIER TYPE AND CONCENTRATION
BY ADJUSTING THE PB:SE RATIO. BELOW THRESHOLD
FOR LASER ACTION, THE EMISSION EXHIBITS TWO SPECTRAL
PEAKS, ONE NEAR 8.5 MICRONS WHICH INCREASES
SUPERLINEARLY WITH CURRENT AND ANOTHER NEAR 10.1
MICRONS WHICH INCREASES SLOWLY WITH CURRENT. LASER
ACTION ASSOCIATED WITH THE 8.5 MICRONS PEAK IS
OBSERVED ABOVE A THRESHOLD CURRENT DENSITY OF 2000
A 1/CM-SQ. FROM MEASUREMENTS WHICH DID NOT
RESOLVE THE CAVITY MODE STRUCTURE, THE EMISSION PEAK
WAS FOUND TO SHIFT TO HIGHER ENERGIES IN A (100)
ORIENTED MAGNETIC FIELD AT THE RATE OF 7.1×10 TO
THE -8TH POWER EV PER GAUSS, OR 17 MC/S PER
GAUSS. THIS IS THE EXPECTED SHIFT IF THE EMISSION
IS ASSOCIATED WITH BAND-TO-BAND TRANSITIONS. THE
THRESHOLD CURRENT DECREASED TO A FRACTION OF ITS ZERO
FIELD VALUE IN A MAGNETIC FIELD OF APPROXIMATELY 10
KILOGAUSS, THEN INCREASED SLOWLY WITH HIGHER FIELDS.
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-622 575

UNITED AIRCRAFT CORP EAST HARTFORD CONN RESEARCH LABS

ULTRASONIC LASER MODULATION TECHNIQUES.

(U)

DESCRIPTIVE NOTE: FINAL REPT. FOR 1 JUL 64-30 JUN 65,
JUN 65 133P DEMARIA, A. J. FLINCHBAUGH, D.

E. DANIELSON, G. E. JR.

REPT. NO. D920259-12

CONTRACT: DA28 043AMC00259E

PROJ: DA 1P622001A056

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: CONTINUATION OF CONTRACT DA19
020AMC0170A. SEE ALSO AD-613 196.

DESCRIPTORS: (*LASERS, MODULATION), (*LIGHT
TRANSMISSION, MODULATION), (*ULTRASONIC RADIATION,
MODULATORS), (*MODULATORS, ULTRASONIC RADIATION),
OPTICS, ACOUSTICS, REFRACTION, DIFFRACTION,
MATHEMATICAL MODELS, ANALOG COMPUTERS,
INTERFEROMETERS, NEODYMIUM, GLASS,
OSCILLATORS

(U)

THE FEASIBILITY OF INTERNALLY MODULATING THE OUTPUT
OF SOLID-STATE LASERS WITHOUT HAVING TO INSERT LOSSY
ELEMENTS INTO THE FABRY-PEROT FEEDBACK
INTERFEROMETER HAS BEEN DEMONSTRATED BY THE
PROPAGATION OF FOCUSED ACOUSTIC WAVES WITHIN A GLASS
LASER ROD. THESE STUDIES HAVE SHOWN THAT THE
ESTABLISHMENT OF AN ALTERNATING CONVERGING/DIVERGING
WAVEGUIDE EFFECT BY THE PROPAGATION OF ACOUSTIC WAVES
WITHIN THE LASER INTERFEROMETER RESULTS IN GATING OF
A ND(3+) GLASS LASER AT THE ACOUSTIC FREQUENCY,
AN INCREASE IN OUTPUT ENERGY BY AS MUCH AS 100%,
AND AN ABSENCE OF DISCRETE AXIAL MODES UNDER GATING
CONDITIONS. THE COMPLEXITY OF THE INTEGRAL
EQUATIONS DESCRIBING THE SLOPE AND TRAJECTORIES OF
LIGHT RAYS TRAVERSING VARIOUS PERIODIC REFRACTIVE
INDEX VARIATIONS GENERATED BY ACOUSTIC WAVES LED TO
THE USE OF ANALOG COMPUTER TECHNIQUES FOR SOLVING
THREE DIFFERENTIAL EQUATIONS FOR THE SLOPE AND
TRAJECTORIES OF THE LIGHT RAYS. THE USE OF THE
SLOPE SOLUTIONS FOR DESIGNING A FABRY-PEROT LASER
INTERFEROMETER CONFIGURATION FOR PULSE SHAPING THE
OUTPUT OF LASER OSCILLATORS IS DESCRIBED. THE
TRAJECTORY SOLUTIONS DESCRIBE THE OPERATION OF THE
CONVERGING-DIVERGING WAVEGUIDE MODULATION EFFECT
WITHIN THE LASER'S INTERFEROMETER.

(U)

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DNC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-627 084 20/5 9/1 17/2
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J ELECTRONIC
COMPONENTS LAB

HIGH-POWER GALLIUM ARSENIDE LASER DIODES. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
OCT 65 24P WANDINGER, L. ; KLOHN, K. L. ;
PROJ: DA-1P6-22001-A-056
TASK: 1P6-22001-A-056-03
MONITOR: ECOM , 2629

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, DIODES(SEMICONDUCTOR),
(*DIODES(SEMICONDUCTOR), LASERS), (*GALLIUM
ALLOYS, ARSENIC ALLOYS), PULSE COMMUNICATION
SYSTEMS, PULSE MODULATION, INFRARED COMMUNICATION
SYSTEMS, PERFORMANCE(ENGINEERING) (U)
IDENTIFIERS: GALLIUM ARSENIDE (U)

THE ESSENTIAL FEATURES IN THE DESIGN, DEVELOPMENT,
AND PERFORMANCE OF GAAS P-N JUNCTION LASER DIODES
WITH HIGH OUTPUT IN THE COHERENT BEAM FOR APPLICATION
IN SECURE COMMUNICATION SYSTEMS ARE DISCUSSED.
AFTER A BRIEF REVIEW OF DEVICE DESIGN PRINCIPLES,
THE TECHNOLOGY OF WAFER PREPARATION, DIFFUSION OF
EXTREMELY PLANAR P-N JUNCTIONS AND THE FORMATION OF
OHMIC, LOW RESISTANCE, AREA CONTACTS DEVELOPED AT
THIS COMMAND IS PRESENTED. MEASUREMENT
TECHNIQUES TO DETERMINE THE PERFORMANCE
CHARACTERISTICS OF THESE LASERS SUCH AS THRESHOLD
CURRENT DENSITY, OUTPUT POWER, EXTERNAL QUANTUM
EFFICIENCY, SPECTRAL DISTRIBUTION AND LINEWIDTH OF
EMITTED RADIATION ARE DISCUSSED. EXPERIMENTAL
UNITS WITH A TOTAL AVERAGE POWER OUTPUT IN THE
COHERENT BEAM OF MORE THAN THREE WATTS CORRESPONDING
TO A QUANTUM EFFICIENCY OF 15 PERCENT HAVE BEEN MADE.
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-627 266 14/5 20/5
MICHIGAN UNIV ANN ARBOR

SYNTHETICAL METHODS IN ELECTRO-OPTICAL SCIENCE. (U)

DESCRIPTIVE NOTE: SEMI-ANNUAL REPT.,
OCT 65 36P STROKE, GEORGE W. ;
CONTRACT: NONR-1224(54)

UNCLASSIFIED REPORT

AVAILABILITY: PUBLISHED IN PHYSICS LETTERS V18 N2
P116-8 15 AUG 1965. NATURE V208 N5016 P1159-62 18
DEC 1965. AGARD PROCEEDINGS, N. A. T. O. MEETING,
PARIS, FRANCE 6-9 SEP 1965. COPIES TO DDC USERS
ONLY.

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*PHOTOGRAPHIC TECHNIQUES, LASERS),
(*OPTICAL IMAGES, SYNTHESIS), ELECTROOPTICS,
LIGHT, PHASE MODULATION, INTERFEROMETERS,
AMPLITUDE MODULATION, PHOTOGRAPHIC IMAGES,
RESOLUTION, FOURIER ANALYSIS
IDENTIFIERS: HOLOGRAPHY (U)
(U)

THREE PAPERS ARE INCLUDED; THEIR TITLES ARE:
OPTICAL IMAGE SYNTHESIS (COMPLEX AMPLITUDE
ADDITION AND SUBTRACTION) BY HOLOGRAPHIC FOURIER
TRANSFORMATION; RECONSTRUCTION OF PHASE OBJECTS BY
HOLOGRAPHY; ELECTRO-OPTICAL IMAGE SYNTHESIS AND
COMMUNICATIONS BY HOLOGRAPHIC (WAVE FRONT-
RECONSTRUCTION) METHODS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-628 546 9/4 20/3
DELAWARE UNIV NEWARK DEPT OF ELECTRICAL ENGINEERING

COMMUNICATION CHARACTERISTICS OF PHOTOELECTRIC
DETECTION. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JUN 64 68P DEAL, JOSEPH HAMILTON, JR.;
REPT. NO. TR-Q41,
CONTRACT: AF-AFOSR-2-63,
MONITOR: AFOSR, 65-0027

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: MASTER'S THESIS.

DESCRIPTORS: (*INFORMATION THEORY, PHOTOELECTRIC
EFFECT), (*PHOTOELECTRIC EFFECT, DEMODULATORS),
(*DEMOMULATORS, PHOTOELECTRIC EFFECT), SIGNAL TO-
NOISE RATIO, LASERS, LIGHT COMMUNICATION SYSTEMS,
WAVE FUNCTIONS, QUANTUM MECHANICS, THERMAL
RADIATION, NOISE (RADIO) (U)
IDENTIFIERS: OPTICAL FREQUENCY (U)

THE PROBABILISTIC NATURE OF THE PHOTOELECTRIC
CONVERSION PROCESS AUGMENTS OTHER SOURCES OF NOISE IN
LIMITING THE PRECISION WITH WHICH ELECTROMAGNETIC
SIGNALS MAY BE MEASURED WITH A PHOTOELECTRIC
DETECTOR. THIS REPORT DEVELOPS PROCEDURES FOR
CONSIDERING THIS ADDED UNCERTAINTY IN SIGNAL
MEASUREMENTS OF INTEREST FOR RADIO TYPE COMMUNICATION
AT OPTICAL FREQUENCIES. A PROBABILISTIC MODEL OF AN
IDEAL PHOTODETECTOR IS USED, IN CONJUNCTION WITH THE
CLASSICAL WAVE THEORY OF THERMAL NOISE, TO COMPUTE
UNCERTAINTIES ASSOCIATED WITH THE LACK OF
PREDICTIBILITY INHERENT IN BOTH PHOTOELECTRIC
CONVERSION AND THERMAL PROCESSES. IT IS SHOWN HOW
THE UNCERTAINTY IN THE DETECTOR OUTPUT MAY BE
CHARACTERIZED BY A SIGNAL-TO-NOISE RATIO, AND ALSO
HOW DECISION CRITERIA FOR SIGNAL DETECTION MAY BE
BASED ON THE PROBABILITY FUNCTIONS WHICH CHARACTERIZE
THE DETECTOR OUTPUT. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-628 607

20/5

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

OPTICAL MISALIGNMENT DUE TO TEMPERATURE GRADIENTS IN
ELECTROOPTIC MODULATOR CRYSTALS, (U)

APR 65

4P

LOSCOE, CLARIE ;METTE, HERBERT

UNCLASSIFIED REPORT

AVAILABILITY: PUBLISHED IN APPLIED OPTICS, V5 N1

P93-6 JAN 1966. COPIES TO DDC USERS ONLY.

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*ELECTROOPTICS, MODULATORS),
(*MODULATORS, MISALIGNMENT), (*THERMAL PROPERTIES,
MODULATORS), LASERS, CRYSTALS, LIGHT
COMMUNICATION SYSTEMS, INDEX OF REFRACTION, THERMAL
EXPANSION, QUARTZ (U)

A POSSIBLE SOURCE OF MISALIGNMENT OF LIGHT IN AN
OPTICAL COMMUNICATION SYSTEM, UTILIZING ELECTROOPTIC
MODULATORS, IS THE DEFLECTION OF THE LIGHT BEAM
WITHIN THE MODULATOR CRYSTAL DUE TO TEMPERATURE
GRADIENTS. THE PRESENT PAPER INVESTIGATES THE
LIGHT DEFLECTION RESULTING FROM A LINEAR TEMPERATURE
GRADIENT ACROSS VARIOUS MODULATOR CRYSTALS. THE
TOTAL EFFECT IS FOUND TO BE THE SUM OF TWO
CONTRIBUTIONS, ONE DUE TO THE CRYSTAL EXPANSION, THE
OTHER DUE TO THE INDEX OF REFRACTION GRADIENT, AND IS
FOUND TO BE SMALLER, BY THE FACTOR 10, IN QUARTZ THAN
IN KDP. THE EXPERIMENTAL METHOD DESCRIBED PROVIDES
ALSO A SIMPLE WAY OF DETERMINING dn/dT IN CRYSTALS
FOR BOTH ORDINARY AND EXTRAORDINARY RAYS.
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-629 473 17/2 22/1
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

A RED BEAM IN THE BLACK SKY, (U)

FEB 66 10P CHERNYSHEV, V. ;
REPT. NO. FTD-TT-65-1683,
MONITOR: TT , 66-60733

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. FROM
KRASNAYA ZVEZDA, (USSR) 14 MAR P1 1965.

DESCRIPTORS: (*LASERS, SPACE COMMUNICATION SYSTEMS),
(*SPACE COMMUNICATION SYSTEMS, ASTRONAUTICS), SPACE
FLIGHT, RUBY, ATMOSPHERE, SEMICONDUCTORS,
USSR (U)

TRANSLATION OF RUSSIAN RESEARCH: SPACE COMMUNICATION
SYSTEMS; USE OF LASERS.

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-629 503 20/5 17/2
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J ELECTRONIC
COMPONENTS LAB

PULSE-CODE MODULATION MULTIPLEX TRANSMISSION OVER AN
INJECTION LASER TRANSMISSION SYSTEM, (U)

OCT 65 2P SCHIEL, E. J. ; BULLWINKEL, E.
C. ; WEIMER, R. B. ;

UNCLASSIFIED REPORT
AVAILABILITY: PUBLISHED IN PROCEEDINGS OF THE IEEE
V53 N12 P2140-1 DEC 1965. COPIES TO DDC USERS ONLY.

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, DATA TRANSMISSION SYSTEMS),
(*DATA TRANSMISSION SYSTEMS, LASERS), (*PULSE CODE
MODULATION, MULTIPLEX), LIGHT COMMUNICATION SYSTEMS (U)
IDENTIFIERS: INJECTION LASERS (U)

REPRINT: PULSE-CODE MODULATION MULTIPLEX TRANSMISSION
OVER AN INJECTION LASER TRANSMISSION SYSTEM.

UNCLASSIFIED

UDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-630 243 17/2 20/5 20/6
LINCOLN LAB MASS INST OF TECH LEXINGTON

OPTICAL COMMUNICATIONS EMPLOYING SEMICONDUCTOR
LASERS.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JUN 65 73P CHATTERTON, F. J. ;
REPT. NO. TR-392,
CONTRACT: AF 19(628)-500,
MONITOR: ESD , TDR-65-232

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, LIGHT COMMUNICATION SYSTEMS),
(*LIGHT COMMUNICATION SYSTEMS, LASERS),
(*SEMICONDUCTORS, LASERS), LIGHT TRANSMISSION,
ATMOSPHERE, FREQUENCY MODULATION, AMPLITUDE
MODULATION, PULSE MODULATION, FIBER OPTICS,
OPTICAL EQUIPMENT, NARROWBAND, CIRCUITS,
ELECTRONIC EQUIPMENT, COMMUNICATION SYSTEMS
IDENTIFIERS: OPTICAL COMMUNICATION SYSTEMS

(U)

(U)

THIS REPORT DISCUSSES THE DEVELOPMENT OF OPTICAL COMMUNICATIONS EMPLOYING SEMICONDUCTOR LASERS-BOTH NONCOHERENT AND COHERENT. THE LARGE MODULATION BANDWIDTH OBTAINABLE WITH THESE DEVICES PERMITS THE DEVELOPMENT OF FREQUENCY- AND PULSE-MODULATION COMMUNICATIONS SYSTEMS WHICH OVERCOME SCINTILLATION NOISE PRODUCED BY THE TURBULENT ATMOSPHERE. EMPHASIS HAS BEEN PLACED ON THE DEVELOPMENT OF COMMUNICATIONS SYSTEMS FOR 98-PERCENT WEATHER CAPABILITY OVER SHORT RANGES, RATHER THAN FAIRWEATHER CAPABILITY OVER LONG RANGES. THE DEVELOPMENT OF SUPPORTING TECHNOLOGY IS PRESENTED IN THE AREAS OF SEMICONDUCTOR LASERS, FIBER OPTICS, OPTICAL SYSTEMS, NARROWBAND OPTICAL FILTERS, PHOTOMULTIPLIERS, AND FREQUENCY- AND PULSE-MODULATION ELECTRONIC CIRCUITRY AND COMPONENTS. MEASUREMENTS OF OPTICAL SIGNALS OVER A TWO-MILE PATH UNDER A FULL VARIETY OF WEATHER CONDITIONS HAVE PERMITTED A COMPARATIVE EVALUATION OF AM, FM, AND PM SYSTEMS. THE RESULTS SHOW CLEARLY THE ADVANTAGE OF FREQUENCY MODULATION AND PULSE MODULATION. MEASUREMENTS OF PULSES TRANSMITTED APPRECIABLY BEYOND THE LIMITS OF VISIBILITY IN SMOG AND FOG INDICATE A CHANNEL BANDWIDTH, LIMITED BY SCATTER-MULTIPATHS, BUT OF THE ORDER OF 200 MCPS. AN ANALYSIS IS PRESENTED OF MULTIPLE-SCATTER PATHS AND SYSTEM DESIGN CONSIDERATIONS FOR THESE CONDITIONS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-631 168 17/2 20/5
LINCOLN LAB MASS INST OF TECH LEXINGTON

SEMICONDUCTOR LASER COMMUNICATIONS THROUGH MULTIPLE-
SCATTER PATHS, (U)

OCT 65 2P CHATTERTON, E. J. ;
REPT. NO. JA-2664,
CONTRACT: AF 19(628)-5167,
MONITOR: ESC , TDR-66-150

UNCLASSIFIED REPORT
AVAILABILITY: PUBLISHED IN PROCEEDINGS OF THE IEEE
V53 N12 P2114-5 DEC 1965. COPIES TO DDC USERS ONLY.

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
*LASERS), LIGHT TRANSMISSION, SCATTERING,
AEROSOLS, ATMOSPHERIC MOTION, MODULATION, FIBER
OPTICS, SEMICONDUCTOR DEVICES (U)

THE REPORT RELATES TO LIMITATIONS ON RANGE AND
RELIABILITY OF WIDE-BAND LASER COMMUNICATIONS CAUSED
BY ATMOSPHERIC TURBULENCE AND MULTIPLE-SCATTERING
AEROSOLS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-635 749 17/2 20/5 9/1
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

P-N JUNCTION LASERS FOR COMMUNICATION SYSTEMS. (U)

APR 65 7P WANDINGER, LOTHAR ;KLOHN,
KENNETH L. ;

UNCLASSIFIED REPORT

AVAILABILITY: PUBLISHED IN IEEE TRANSACTIONS ON
AEROSPACE AND ELECTRONIC SYSTEMS VAES-2 N3 P271-7
MAY 1966.

SUPPLEMENTARY NOTE:

DESCRIPTORS: (*LASERS, LIGHT COMMUNICATION SYSTEMS),
(*DIODES(SEMICONDUCTOR), LASERS), GALLIUM ALLOYS,
ARSENIC ALLOYS, VOICE COMMUNICATION SYSTEMS,
PUMPING(OPTICAL), PULSE MODULATION,
COMMUNICATION EQUIPMENT, SEMICONDUCTORS (U)

SECURE GROUND-TO-GROUND COMMUNICATION LINKS,
COMMUNICATION FROM SATELLITES AND SPACE PROBES, AND
COHERENT OPTICAL LOGIC IN HIGH-SPEED INTEGRATED
COMPUTERS LIE WITHIN THE REALM OF SEMICONDUCTOR
SINGLE LASERS OR LASER ARRAYS. LASERS OF THIS TYPE
HAVE THE ADVANTAGE OF EXTREMELY SMALL SIZE, EASE OF
DIRECT MODULATION, AND HIGH EFFICIENCY. RUGGEDNESS
AND SIMPLICITY OF PUMPING PROMISE HIGH RELIABILITY
FOR MILITARY ELECTRONICS. A DISCUSSION IS
PRESENTED ON DESIGN CONSIDERATIONS, TECHNOLOGICAL
PROBLEMS, AND PERFORMANCE OF P-N JUNCTION LASERS FOR
SHORT RANGE COMMUNICATION SYSTEMS. AFTER A BRIEF
REVIEW OF FUNDAMENTAL PRINCIPLES FOR LASING ACTION IN
SEMICONDUCTORS, AN ACCOUNT IS PRESENTED OF PREVIOUSLY
UNPUBLISHED TECHNOLOGICAL PROCEDURES REQUIRED TO
ACHIEVE GAAAS LASER DIODES WITH HIGH OUTPUT IN THE
COHERENT BEAM AT A HIGH PULSE RATE REQUIRED TO
OPERATE A PULSE CODE, MODULATED VOICE TRANSMISSION
SYSTEM. A DESCRIPTION IS GIVEN OF WAFER
PREPARATION, DIFFUSION OF EXTREMELY PLANAR P-N
JUNCTIONS, AND THE FORMATION OF OHMIC, LOW-RESISTANCE
AREA CONTACTS. MEASUREMENT TECHNIQUES TO DETERMINE
THE PERFORMANCE CHARACTERISTICS OF THESE LASERS WITH
RESPECT TO SUCH FACTORS AS THRESHOLD CURRENT DENSITY,
MAXIMUM OUTPUT POWER, EXTERNAL QUANTUM EFFICIENCY,
SPECTRAL DISTRIBUTION, AND LINEWIDTH OF EMITTED
RADIATION ARE DISCUSSED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-642 514 20/5 20/12
MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF ELECTRICAL
ENGINEERING

EFFECTS OF PRESSURE ON A SEMICONDUCTOR LASER
RADIATION. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
SEP 66 146P FILHO, JOSE ELLIS RIPPER ;
REPT. NO. TR-5
CONTRACT: DA-31-124-ARO(D)-92 ,NONR-1841(51)

UNCLASSIFIED REPORT

DESCRIPTORS: (*SEMICONDUCTOR DEVICES, *LASERS),
(*LEAD COMPOUNDS, *BAND THEORY OF SOLIDS),
SULFIDES, SELENIDES, TELLURIDES, GALLIUM ALLOYS,
ARSENIC ALLOYS, PRESSURE, EMISSIVITY,
MODULATION, MOMENTUM, DEFORMATION, POLARIZATION,
GAIN, FREQUENCY, CARRIERS(SEMICONDUCTORS),
ULTRASONIC RADIATION, DOPING (U)
IDENTIFIERS: AUGMENTED PLANE WAVE METHODS, GALLIUM
ARSENIDE, LEAD SELENIDE, LEAD SULFIDE, LEAD
TELLURIDE, SEMICONDUCTOR LASERS (U)

THE RESULTS OF THE RELATIVISTIC APW CALCULATION
OF THE BAND STRUCTURE, MOMENTUM MATRIX ELEMENTS AND
DEFORMATION POTENTIALS OF THE LEAD SALTS ARE USED TO
CALCULATE THE EFFECTS OF CONSTANT PRESSURE ON LASERS
MADE OF THESE MATERIALS. BEHAVIOR OF THE
FREQUENCY, POLARIZATION AND RELATIVE GAIN OF THESE
LASERS ARE CALCULATED FOR SEVERAL DOPINGS, AND
INJECTION LEVELS, WHEN ISOTROPIC AND UNIAXIAL
PRESSURES ARE APPLIED. THE EFFECT OF SMALL DYNAMIC
PRESSURE ON SEMICONDUCTOR LASERS IS ANALYZED,
RESULTING IN A FREQUENCY MODULATION OF THE LASER
RADIATION. AN EXPERIMENT CONFIRMING THIS ANALYSIS
WAS PERFORMED. A 2 MC/S FREQUENCY MODULATION WAS
INTRODUCED INTO A CW GAAS INJECTION LASER WITH AN
ULTRASONIC WAVE. THIS MODULATION WAS THEN DETECTED
WITH THE USE OF A FABRY-PEROT INTERFEROMETER. A
THEORETICAL ANALYSIS OF THE LIMITATIONS OF THE
METHOD OF MODULATION DEMONSTRATED ABOVE WAS CARRIED
OUT WITH A REGARD TO ITS DEVICE APPLICATIONS.
(AUTHOR) (U)

UNCLASSIFIED

DNC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-643 606 20/5

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

LASER.

(U)

NOV 66 20P ANG-JU, CHU ;
REPT. NO. FTD-TT-65-1453
MONITOR: TT 67-60190

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF TIEN TZU CHI
SHU (CHINESE PEOPLE'S REPUBLIC) N3 P24-8 1964.

DESCRIPTORS: (*LASERS, CHINA), PROPAGATION,
SCIENTIFIC RESEARCH, RUBY, GASES, MODULATION

(U)

THE SIMILARITIES BETWEEN LIGHT AND ELECTROMAGNETIC
WAVES ARE COMPARED. THE LASER OSCILLATOR IS
DESCRIBED ALONG WITH LASER RADIATION. THE USE OF
THE LASER IN SPACE RESEARCH, COMMUNICATION, MEDICINE,
PHOTOGRAPHY, ETC., IS DESCRIBED. THE RUBY LASER
AND A GASEOUS STATE LASER ARE DESCRIBED.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-643 959 20/5 1/2 17/2 17/8
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

LASER LIGHT ADVANCES IN AVIATION. (U)

SEP 66 16P CHIN, YEN YOU ;
REPT. NO. FTD-TT-65-361

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF HANG K'UNG CHIH
SHIH (CHINESE PEOPLE'S REPUBLIC) N7 P7-12
1964.

DESCRIPTORS: (*LASERS, AERONAUTICS), LIGHT
COMMUNICATION SYSTEMS, OPTICAL TRACKING, OPDAR,
OPTICAL EQUIPMENT, RANGE FINDING, CHINA (U)

THE ARTICLE EXAMINES LASER LIGHT ADVANCES IN THE
FIELD OF AVIATION AND ITS APPLICATIONS IN
COMMUNICATIONS, SEARCHING, TRACKING AND
INTERCEPTION. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-645 640 9/4 17/2 20/5
DELAWARE UNIV NEWARK DEPT OF ELECTRICAL ENGINEERING

QUANTUM LIMITATIONS TO ELECTROMAGNETIC SIGNAL
MEASUREMENTS.

(U)

DESCRIPTIVE NOTE: FINAL REPT.,

DEC 66 20P BOLGIANO, L. PAUL ;

CONTRACT: AF-AFOSR-2-65

PROJ: AF-9768

TASK: 976802

MONITOR: AFOSR 67-0152

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-610 422.

DESCRIPTORS: (*QUANTUM STATISTICS, *INFORMATION
THEORY), (*FIELD THEORY, *LIGHT COMMUNICATION
SYSTEMS), ELECTROMAGNETIC WAVES, PHOTOELECTRIC
EFFECT, LASERS, DETECTION

(U)

IDENTIFIERS: PHOTODETECTION, OPTICAL COMMUNICATION
SYSTEMS

(U)

THE REPORT DESCRIBES WORK ON THE DEVELOPMENT OF AN
EFFECTIVE STATISTICAL COMMUNICATION THEORY FOR
OPTICAL COMMUNICATIONS. PHOTODETECTION STATISTICS
HAVE BEEN COMPUTED FOR AN OPTICAL ILLUMINATION
CONSISTING OF A CW SIGNAL AND NARROWBAND NOISE AND A
FORMULA OBTAINED FOR THE INFORMATION TRANSMITTABLE BY
AN OPTICAL DETECTOR. QUANTUM ELECTRODYNAMICS HAS
BEEN USED TO EVALUATE THE STATISTICS OF A NARROWBAND
OPTICAL COMMUNICATION SYSTEM AND TO COMPUTE THE
STATISTICS OF A COUPLED MODE SYSTEM. THE REPORT
SUMMARIZES THIS WORK AND LISTS PUBLICATIONS DURING
THE GRANT PERIOD. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-649 851 20/6 20/10

BRANDEIS UNIV WALTHAM MASS DEPT OF PHYSICS

QUANTUM THEORY OF INTERNALLY MODULATED LASERS, (U)

FEB 67 132P TITTERTON, PAUL J. ;

REPT. NO. SCIENTIFIC-4

CONTRACT: AF 19(628)-5833

PROJ: AF-4645

TASK: 464502

MONITOR: AFCRL 67-0119

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, MODULATION), (*AMPLITUDE
MODULATION, LASERS), (*FREQUENCY MODULATION,
LASERS), QUANTUM MECHANICS, RESONATORS, FIELD
THEORY, GAIN, COHERENT RADIATION, THEORY,
QUARTZ, POTASSIUM COMPOUNDS, PHOSPHATES,
MODULATORS (U)

IDENTIFIERS: POTASSIUM DIHYDROPHATE (U)

RECENT EXPERIMENTS HAVE REVEALED TWO DISTINCT MODES
OF OPERATION OF THE INTERNALLY MODULATED LASER, THE
AM AND FM MODES, EACH OF WHICH REMOVES ALMOST ALL
RANDOM PHASE AND AMPLITUDE FLUCTUATIONS IN THE LASER
OUTPUT. A QUANTUM THEORY OF THE MODULATION PROCESS
IS DEVELOPED IN TERMS OF THE TRAVELLING WAVE MODES OF
AN OPTICAL RESONATOR. THE THEORY PREDICTS THE
EFFECT OF THE MODULATOR ON AN ARBITRARY WAVE PACKET
OF ELECTROMAGNETIC ENERGY. A SATURATION ANALYSIS
OF THE STEADY STATE OPERATION OF BOTH THE AM AND
THE FM LASER IS PERFORMED IN AN EFFECTIVE LINEAR
RESPONSE APPROXIMATION. EFFECTIVE GAIN CURVES ARE
FOUND AND PLOTTED FOR MULTIMODE AM, SINGLE MODE
AM AND SINGLE MODE FM CASES. EXPERIMENTS ARE
SUGGESTED TO TEST DETAILS OF THE MODULATION PROCESS
WHOSE EFFECTS ARE REVEALED BY THIS ANALYSIS.
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-650 870 20/5
H NU SYSTEMS INC MENLO PARK CALIF

LASER PARAMETER MEASUREMENTS HANDBOOK. VOLUME
I.

(U)

DESCRIPTIVE NOTE: FINAL REPT.,
FEB 67 387P HEARD, H. G. ;
CONTRACT: AF 30(602)-3346
PROJ: AF-5519
TASK: 551903
MONITOR: RADC TR-66-704-VOL-1

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-650 871, AD-650
872.

DESCRIPTORS: (*LASERS, HANDBOOKS), ELECTRICAL
PROPERTIES, OPTICAL PROPERTIES, MEASUREMENT,
COHERENT RADIATION, PROBES, TEST EQUIPMENT,
ENERGY, POWER, CALORIMETRY, PHOTOCHEMISTRY,
SPECTROSCOPY, REVIEWS

(U)

THE HANDBOOK IS A COMPENDIUM OF MEASUREMENT THAT
ENCOMPASSES THE LASER TECHNOLOGY. IT INCLUDES A
WEALTH OF INFORMATION GLEANED FROM OVER 650 ARTICLES
SURVEYED IN AN EXHAUSTIVE LITERATURE SEARCH THAT
REVIEWED AMERICAN AS WELL AS FOREIGN SCIENTIFIC
JOURNALS, AND GOVERNMENT REPORTS. THE WORK
CONTAINS THE CONTRIBUTIONS OF 37 AUTHORS WHOSE WORKS
WERE EDITED TO CONFORM WITH THE TEXT AND ABRIDGED TO
ELIMINATE REDUNDANCY. IT IS BELIEVED THAT THE TEXT
TREATS ALL OF THE SIGNIFICANT LASER MEASUREMENT
TECHNIQUES THAT HAVE BEEN PUBLISHED TO DATE IN THE
AREAS OF BEAM SAMPLING, BEAM PARAMETERS, POWER,
ENERGY, GAIN, WAVELENGTH, BANDWIDTH, STABILITY AND
FREQUENCY STABILITY. THE TECHNIQUES OF MODULATION
AND THE METHODS OF MEASUREMENT ARE TREATED AS ARE THE
COMMUNICATION ASPECTS OF NOISE IN THE LASER SIGNAL
SOURCE. THIS VOLUME CONTAINS CHAPTERS ENTITLED:
LASER PARAMETERS AND MEASUREMENT; BEAM SAMPLING
TECHNIQUES; MEASUREMENT OF BEAM PARAMETERS;
MEASUREMENT OF ENERGY AND POWER.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-650 871 20/5
H NU SYSTEMS INC MENLO PARK CALIF

LASER PARAMETER MEASUREMENTS HANDBOOK. VOLUME
II. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
FEB 67 235P HEARD, H. G. I
CONTRACT: AF 30(602)-3346
PROJ: AF-5519
TASK: 551903
MONITOR: RANDC TR-66-704-VOL-2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-650 870, AD-650
872.

DESCRIPTORS: (*LASERS, HANDBOOKS), ELECTRICAL
PROPERTIES, OPTICAL PROPERTIES, MEASUREMENT,
COHERENT RADIATION, GAS LASERS, GAIN, PLASMA
MEDIUM, ATOMIC ENERGY LEVELS, LINE SPECTRUM, TEST
EQUIPMENT, MONOCHROMATIC LIGHT, SPECTROSCOPY,
REVIEWS (U)

THE LASER PARAMETER MEASUREMENTS HANDBOOK
IS A COMPENDIUM OF MEASUREMENT THAT ENCOMPASSES THE
LASER TECHNOLOGY. IT INCLUDES A WEALTH OF
INFORMATION GLEANED FROM OVER 650 ARTICLES SURVEYED
IN AN EXHAUSTIVE LITERATURE SEARCH THAT REVIEWED
AMERICAN AS WELL AS FOREIGN SCIENTIFIC JOURNALS,
AND GOVERNMENT REPORTS. THIS WORK CONTAINS THE
CONTRIBUTIONS OF 37 AUTHORS WHOSE WORKS WERE EDITED
TO CONFORM WITH THE TEXT AND ABRIDGED TO ELIMINATE
REDUNDANCY. IT IS BELIEVED THAT THE TEXT TREATS
ALL OF THE SIGNIFICANT LASER MEASUREMENT TECHNIQUES
THAT HAVE BEEN PUBLISHED TO DATE IN THE AREAS OF BEAM
SAMPLING, BEAM PARAMETERS, POWER, ENERGY, GAIN,
WAVELENGTH, BANDWIDTH, COHERENCE AND FREQUENCY
STABILITY. THE TECHNIQUES OF MODULATION AND THE
METHODS OF MEASUREMENT ARE TREATED AS ARE THE
COMMUNICATION ASPECTS OF NOISE IN THE LASER SIGNAL
SOURCE. THIS VOLUME CONTAINS CHAPTERS ENTITLED:
MEASUREMENT OF GAIN PARAMETERS; MEASUREMENT OF
WAVELENGTH. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-650 872 20/5
H NU SYSTEMS INC MENLO PARK CALIF

LASER PARAMETER MEASUREMENTS HANDBOOK. VOLUME
III.

(U)

DESCRIPTIVE NOTE: FINAL REPT.,
FEB 67 296P HEARD, H. G. ;
CONTRACT: AF 30(602)-3346
PROJ: AF-5519
TASK: 551903
MONITOR: RADC TR-66-704-VOL-3

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-650 870, AD-650
871.

DESCRIPTORS: (*LASERS, HANDBOOKS), ELECTRICAL
PROPERTIES, OPTICAL PROPERTIES, MEASUREMENT,
COHERENT RADIATION, BANDWIDTH, LINE SPECTRUM,
FLUORESCENCE, DOPPLER EFFECT, GAIN, GAS LASERS,
INTERFEROMETERS, STABILITY, NOISE, MODULATION,
PHOTONS, REVIEWS

(U)

THE HANDBOOK IS A COMPENDIUM OF MEASUREMENT THAT
ENCOMPASSES THE LASER TECHNOLOGY. IT INCLUDES A
WEALTH OF INFORMATION GLEANED FROM OVER 650 ARTICLES
SURVEYED IN AN EXHAUSTIVE LITERATURE SEARCH THAT
REVIEWED AMERICAN AS WELL AS FOREIGN SCIENTIFIC
JOURNALS, AND GOVERNMENT REPORTS. THIS WORK
CONTAINS THE CONTRIBUTIONS OF 37 AUTHORS WHOSE WORKS
WERE EDITED TO CONFORM WITH THE TEXT AND ABRIDGED TO
ELIMINATE REDUNDANCY. IT IS BELIEVED THAT THE TEXT
TREATS ALL OF THE SIGNIFICANT LASER MEASUREMENT
TECHNIQUES THAT HAVE BEEN PUBLISHED TO DATE IN THE
AREAS OF BEAM SAMPLING; BEAM PARAMETERS; POWER,
ENERGY; GAIN; WAVELENGTH; BANDWIDTH; COHERENCE AND
FREQUENCY STABILITY. THE TECHNIQUES OF MODULATION
AND THE METHODS OF MEASUREMENT ARE TREATED AS ARE THE
COMMUNICATION ASPECTS OF NOISE IN THE LASER SIGNAL
SOURCE. THIS VOLUME CONTAINS CHAPTERS ENTITLED:
MEASUREMENT OF BANDWIDTH AND COHERENCE;
MEASUREMENT OF FREQUENCY STABILITY; MEASUREMENT
OF NOISE AND MODULATION OF LASER CARRIERS.

(U)

UNCLASSIFIED

DNC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-653 962 17/2 20/5

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

RAY PENETRATING INTO THE FUTURE ULTRADISTANT COSMIC
COMMUNICATION LIGHT PULSES OF SATELLITES. (U)

FEB 67 13P ALEKSANDROV, N. I
REPT. NO. FTD-HT-66-439
MONITOR: TT 67-62146

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: LUCH, PRONIKAYUSHCHII V BUDUSHCHEF
... , UNEDITED ROUGH DRAFT TRANS. OF NAUCHNO-
TEKHNICHESKIE OBRSHCHESTVA SSSR, V6 N8 P41-3 1964.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
*LASERS), SEMICONDUCTORS, GALLIUM ARSENIDES,
RELATIVITY THEORY, SPACE COMMUNICATION SYSTEMS,
SATELLITES(ARTIFICIAL) (U)

THE LENIN PRIZE FOR 1964 WAS PRESENTED TO
ASSOCIATE MEMBER OF THE AN SSSR BENTSION
VUL AND A LARGE GROUP OF COWORKERS FOR THE
DEVELOPMENT OF A GALLIUM-ARSENIDE SEMICONDUCTOR
LASER. THE SEMICONDUCTOR LASER IS ALMOST 100%
EFFICIENT AND ITS MICROMINIATURE SIZE HOLDS GREAT
PROMISE FOR USE IN COMPUTERS TO ACHIEVE SPEEDS OF
TENS OF BILLIONS OF OPERATIONS PER SECOND. DIRECT
COMMUNICATION OVER DISTANCES OF SEVERAL LIGHT YEARS
IS CONSIDERED POSSIBLE WITH THE USE OF LASERS.
SATELLITES CARRYING A LASER COULD BE EASILY SEEN
AND ACCURATELY TRACKED BOTH DAY AND NIGHT.
APPLICATIONS OF LASERS IN RADIO, TELEPHONE AND
TELEVISION COMMUNICATIONS AND IN CHEMISTRY ARE
MENTIONED. QUANTUM TECHNIQUES MAKE POSSIBLE A
CONSTRUCTION OF CLOCKS ACCURATE TO ONE SECOND IN TEN
THOUSAND YEARS WHICH COULD BE USED TO CONDUCT
RELATIVITY EXPERIMENTS. USE OF THE LASER BEAM AS A
METAL WORKING AND SURGICAL TOOL IS MENTIONED. LONG
DISTANCE, HIGH-EFFICIENCY TRANSMISSION OF ENERGY BY
LASER BEAM, ESPECIALLY IN SPACE WHERE THE ABSORBING
AND SCATTERING EFFECTS OF THE ATMOSPHERE ARE AVOIDED,
IS CONSIDERED ABSOLUTELY ESSENTIAL IN THE CONQUEST OF
SPACE. DIRECT CONVERSION OF MATTER INTO ENERGY
WITHOUT EXPLOSION IS POSSIBLE USING QUANTUM DEVICES.
QUANTUM ENGINES MAY UTILIZE SOLAR ENERGY DURING
SPACE FLIGHT. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-655 119 17/2 20/10 20/5
PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF ELECTRICAL
ENGINEERING

A QUANTUM STATISTICAL ANALYSIS OF A FREQUENCY
MODULATED LASER COMMUNICATION SYSTEM. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
APR 67 86P RUGGIERI, NEIL F. ;
CONTRACT: DA-31-124-ARO(D)-383
PROJ: DA-20014501B31E
MONITOR: AROD 5659:3-E

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
LASERS); (*LASERS; *QUANTUM STATISTICS);
FREQUENCY MODULATION; OSCILLATORS; DEMODULATION;
PROBABILITY DENSITY FUNCTIONS; SIGNAL-TO-NOISE
RATIO (U)

IN THIS ANALYSIS THE QUANTUM STATISTICS OF THE
RECEIVED SIGNAL OF A FREQUENCY MODULATED LASER
COMMUNICATION SYSTEM ARE DERIVED. IN PARTICULAR
THE DETECTION STATISTICS FOR HETERODYNE AND ELECTRIC
FIELD DETECTION OF THE FREQUENCY MODULATED LASER BEAM
ARE DETERMINED. THESE DETECTION STATISTICS ARE
USED TO DEFINE A MEASURE OF THE COMMUNICATION SYSTEM
PERFORMANCE IN TERMS OF A SIGNAL TO NOISE RATIO.
THE DEVELOPMENT OF THE QUANTUM ELECTROMAGNETIC
FIELD IN TERMS OF THE PHOTON ANNIHILATION EIGENSTATES
IS THE BASIS FOR DETERMINING THESE STATISTICS. THE
DERIVATION USED ACCOUNTS FOR FLUCTUATIONS IN THE
CARRIER, FLUCTUATIONS DUE TO BACKGROUND RADIATION
INTRODUCED AFTER MODULATION, FLUCTUATIONS DUE TO THE
LOCAL LASER OSCILLATOR, AND ZERO POINT FIELD
FLUCTUATIONS. THE RESULTS OF THIS ANALYSIS
INDICATE THE PROBABILITY DISTRIBUTION FOR THE OPTICAL
HETERODYNE DETECTION IS NOT A FAMILIAR ONE OF
CLASSICAL COMMUNICATION THEORY, BUT IT IS OF THE FORM
OF PROBABILITY DISTRIBUTION THAT SATISFIES
EXPERIMENTALLY MEASURED PHOTOCOUNT STATISTICS OF
UNMODULATED LASER RADIATION. THE PROBABILITY
DISTRIBUTION FOR THE ELECTRIC FIELD INTENSITY
DETECTION OF THE FREQUENCY MODULATED LASER BEAM IS
THE FAMILIAR GAUSSIAN DISTRIBUTION. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-655 774 20/5 17/2 17/8 13/8
 14/5

AIR FORCE CAMBRIDGE RESEARCH LABS L G HANSCOM FIELD
MASS

A BIBLIOGRAPHY OF LASER APPLICATIONS.

(U)

DESCRIPTIVE NOTE: SPECIAL REPORTS NO. 62,

APR 67 46P STICKLEY, C. MARTIN ;

GINGRANDE, ARTHUR ;

REPT. NO. AFCRL-67-0223

PROJ: AF-4645

TASK: 464502

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, BIBLIOGRAPHIES),
MEASUREMENT, LIGHT COMMUNICATION SYSTEMS, OPDAR,
INSTRUMENTATION, CHEMISTRY, PHOTOGRAPHY,
MATERIAL FORMING

(U)

THE BIBLIOGRAPHY OF LASER APPLICATIONS CONTAINS 644
ENTRIES FROM THE OPEN LITERATURE FOR THE PERIOD 1961
THROUGH SEPTEMBER 1966. THE ENTRIES ARE DIVIDED
INTO THE FOLLOWING MAJOR AREAS: MECHANICAL
MEASUREMENTS AND STANDARDS; COMMUNICATIONS
APPLICATIONS; RADAR AND TRACKING APPLICATIONS;
MILITARY APPLICATIONS; OPTICAL SIGNAL PROCESSING;
INTERFEROMETRY AND TESTING OF OPTICAL COMPONENTS;
APPLICATIONS TO SCIENTIFIC STUDIES; APPLICATIONS IN
CHEMISTRY; PHOTOGRAPHIC APPLICATIONS; METALWORKING;
AND MISCELLANEOUS APPLICATIONS. THE ENTRIES ARE
FURTHER SUBDIVIDED INTO 78 OTHER CATEGORIES.
APPLICATIONS IN MEDICAL AND BIOLOGICAL RESEARCH ARE
NOT INCLUDED; COMPLETE COVERAGE IN THE OTHER AREAS IS
NOT GUARANTEED. UNDER SOME TOPICS (DETECTION
TECHNIQUES, SPECTROSCOPY, INTERACTION WITH ACOUSTIC
WAVES, PLASMA DIAGNOSTICS, NONLINEAR OPTICS, GAS
BREAKDOWN, FILTERING, HOLOGRAPHY) SO MUCH HAS BEEN
PUBLISHED THAT ONLY REVIEW ARTICLES, ARTICLES OF
MAJOR IMPORTANCE, AND VERY RECENT ARTICLES COULD BE
INCLUDED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-658 175 20/5
TRG INC MELVILLE N Y

MULTI-MODE HIGH ENERGY LASER TRANSMITTER. (U)

DESCRIPTIVE NOTE: INTERIM REPT.,
AUG 67 95P POGODA, A. L. MCGUIRE, J.
N. ;
REPT. NO. TRG-086-IR-1
CONTRACT: AF 33(615)-3888

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, *TRANSMITTER-RECEIVERS),
RUBY, ENERGY, Q METERS, AMPLIFIERS, DESIGN,
OPERATION, BORESIGHTING, SERVOMECHANISMS,
TELESCOPES, MULTIPLE OPERATION (U)

THE REPORT OUTLINES THE PROGRESS MADE TOWARD COMPLETION OF THE MULTI-MODE HIGH ENERGY LASER TRANSMITTER SYSTEM (MMHELTS) IN THE PERIOD FROM 6 SEPTEMBER 1966 THROUGH 15 MAY 1967. IN ADDITION, IT DISCUSSES DESIGN CHANGES REQUIRED FOR ENHANCEMENT OF THE OPERATION OF THE EQUIPMENT IN THE FIELD. AREAS WHICH TRG BELIEVE TO BE NECESSARY ADDITIONS AND/OR LOGICAL IMPROVEMENTS TO THE OPERATIONAL CAPABILITY OF THE OVERALL SYSTEM ARE DISCUSSED IN DETAIL. THE OVERALL CONFIGURATION OF THE HIGH ENERGY SYSTEM HAS NOT BEEN CHANGED FROM THAT IN THE DESIGN EXHIBIT, SUBMITTED TO WRIGHT-PATTERSON AIR FORCE BASE ON 1 SEPTEMBER 1966. THE RUBY LENGTH OF THE Q-SWITCHED SYSTEM, HOWEVER, HAS BEEN REDUCED TO A TOTAL OF 17 INCHES. THE OVERALL LENGTH HAS BEEN DIVIDED INTO ONE BREWSTER'S ANGLED 4 IN. Q-SWITCHED OSCILLATOR FOLLOWED BY 13 IN. OF ACTIVE AMPLIFIER. THE 13 IN. AMPLIFIER SECTION CONSISTS OF A 4 IN. CAVITY FOLLOWED BY A 9 IN. CAVITY BOTH OF WHICH ARE BREWSTER'S ANGLED. ALL RUBY RODS WILL REMAIN 15MM IN DIAMETER. THE STATUS OF THE DYNAMIC BORESIGHTING SYSTEM DEVELOPMENT EFFORT IS ALSO DISCUSSED HEREIN. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-658 382 20/5

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

LASERS IN SPACE, ON THE EARTH, AND UNDER WATER, (U)

APR 67 92P CHERNYSHEV, V. N. ;
REPT. NO. FTD-MT-65-373
MONITOR: TT 67-62867

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF MONO.
LAZERY V KOSMOSE; NA ZEMLE I POD VODOI, MOSCOW,
1964 P1-104.

DESCRIPTORS: (*LASERS, OPTICAL EQUIPMENT),
PARTICLE BEAMS, DESIGN, QUANTUM MECHANICS,
GENERATORS, DETECTION, AMPLIFIERS, ENERGY, GAS
LASERS, COMMUNICATION SYSTEMS, NAVIGATION,
UNDERWATER, FIBER OPTICS, USSR (U)

THE WORKING PRINCIPLES ARE CONSIDERED OF QUANTUM-
MECHANICAL GENERATORS AND AMPLIFIERS OF OPTICAL
RANGE-LASERS. LASER DEVICES OF DIFFERENT TYPES AND
ASSIGNMENTS ARE DISCUSSED. LASER RADIATION
(ABROAD THEY ARE SOMETIMES CALLED 'DEATH RAYS')
CAN BE USED NOT ONLY AS A WEAPON OF DESTRUCTION, BUT
ALSO AS A MEANS OF SUPER-RANGE COMMUNICATION,
DETECTION, AND NAVIGATION. THE PAMPHLET
GENERALIZES EXTENSIVE BUT SEPARATED MATERIAL
PUBLISHED IN DOMESTIC AND FOREIGN PERIODIC PRESS.
THE WORK IS DESIGNED FOR READERS WITH SECONDARY
EDUCATION, FAMILIAR WITH THE BASES OF RADIO
ENGINEERING. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-659 738 20/5 20/6 20/12
TEXAS UNIV AUSTIN LABS FOR ELECTRONICS AND RELATED
SCIENCE RESEARCH

A UNIQUE LASER DETECTOR UTILIZING THE PHOTODIELECTRIC
EFFECT IN COOLED SEMICONDUCTORS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
SEP 67 175P STONE, JACKIE L. ; HARTWIG,
WILLIAM H. ;
REPT. NO. TR-39
CONTRACT: AF-AFOSR-766-67
PROJ: AF-4751
MONITOR: AFOSR 67-2138

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, *DETECTORS),
(*COMMUNICATION EQUIPMENT, LASERS),
(*SEMICONDUCTORS, LASERS), ELECTROOPTICS,
PHOTOCONDUCTIVITY, GERMANIUM, PHOTOELECTRIC
MATERIALS, DIELECTRIC PROPERTIES, RELAXATION TIME,
LIGHT, RESONANT FREQUENCY, SENSITIVITY,
BANDWIDTH, SPECTRA (INFRARED), SPACE
COMMUNICATION SYSTEMS (U)

A CHANGE IN THE REAL PART OF THE DIELECTRIC
CONSTANT OF SEMICONDUCTORS IS OBSERVABLE AT 4.2K.
THE DIELECTRIC PERTURBATION CAN BE OPTICALLY
INDUCED AND SUBSEQUENTLY USED TO VARY THE RESONANT
FREQUENCY OF A HIGH Q, SUPERCONDUCTING RE-ENTRANT
CAVITY. THE FREQUENCY CHANGES ARE PREDICTABLE FROM
A CLASSICAL TREATMENT OF THE COMPLEX DIELECTRIC
CONSTANT IN THE PRESENCE OF OPTICAL AND THERMAL
CARRIERS. A TRANSMISSION LINE EQUIVALENT CIRCUIT
IS USED TO ACCURATELY PREDICT THE BEHAVIOR OF A
PHOTODIELECTRIC DETECTOR. THE IMPORTANT PARAMETERS
WHICH AFFECT THE PERFORMANCE OF THE DETECTOR ARE THE
FREE CARRIER RELAXATION TIME, RECOMBINATION LIFETIME,
THE UNLOADED CAVITY RESONANT FREQUENCY, SAMPLE
THICKNESS, AND THE CAPACITIVE LOADING EFFECTS.
THESE ARE REFERRED TO AS THE SENSITIVITY
PARAMETERS. THE ULTIMATE FREQUENCY RESPONSE
(I.E. THE RATE AT WHICH THE FREQUENCY CAN BE
VARIED) IS SHOWN TO BE LIMITED BY THE FREE CARRIER
LIFETIME IN THE SEMICONDUCTOR SAMPLE. THE
PHOTODIELECTRIC RECEIVER IS USED IN THE DESIGN OF AN
OPTICAL COMMUNICATIONS SYSTEM WHICH WAS USED TO
DETECT VIDEO RATE, AMPLITUDE MODULATION OF A 9000A
INFRARED LIGHT SOURCE, THREE SUCH SYSTEMS ARE
DESCRIBED. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-664 197 9/5 20/12
CALIFORNIA UNIV LOS ANGELES DEPT OF ENGINEERING

RESEARCH ON SOLID STATE HETERODYNE DETECTORS FOR
ULTRASTABLE OPTICAL SOURCES. (U)

DESCRIPTIVE NOTE: ANNUAL REPT. 15 JUN 66-15 JUN 67,
DEC 67 18P VISWANATHAN, C. R. ;
REPT. NO. 67-57
CONTRACT: DA-28-043-AMC-02341(E)
PROJ: DA-1H6-22001-A-056
TASK: 1H6-22001-A-056-03
MONITOR: ECOM 02341-2

UNCLASSIFIED REPORT

DESCRIPTORS: (*DEMODULATORS, SEMICONDUCTOR
DEVICES), PHOTOELECTRIC EFFECT, SILICON, SILICON
DIOXIDE, GOLD, BAND THEORY OF SOLIDS, RHENIUM,
TUNGSTEN, MOLYBDENUM, OPTICAL EQUIPMENT,
LASERS (U)
IDENTIFIERS: OPTICAL DETECTORS, METAL OXIDE
SEMICONDUCTORS (U)

PHOTO EMISSION FROM SOLID TO SOLID IN MOS
STRUCTURES HAS BEEN STUDIED IN A SILICON-
SILICON OXIDE-GOLD STRUCTURE. THIS STUDY GAVE
INSIGHT INTO THE LOCATION OF THE SILICON DIOXIDE
CONDUCTION BAND WITH RESPECT TO THE SILICON ENERGY
BANDS. IT WAS ALSO FOUND THAT THE NUMBER OF TRAPS
IS HIGHER IN P SAMPLES THAN IN N SAMPLES.
PHOTOEMISSION FROM SOLIDS INTO VACUUM WAS STUDIED
AND THE METHOD OF PERIODIC SCHOTTKY DEVIATION HAS
BEEN USED AS A TOOL FOR EVALUATING SURFACE BARRIERS
OF METALS. BY USING PHASE MATCHING INSTEAD OF
AMPLITUDE MATCHING BETWEEN THE PREDICTED CURVE AND
THE EXPERIMENTAL CURVE A BARRIER HEIGHT OF 7.4, 6.1
AND 5.2 eV FOR RHENIUM, TUNGSTEN, AND
MOLYBDENUM WAS OBTAINED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-665 584 20/5
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

LASER WITH MAXIMUM DEEP MODULATION OF RESONATOR
QUALITY, (U)

AUG 67 10P STARUNOV, M. H. ;EROMKA, V.
D. ;BONCHKOVSKII, V. Y. ;
REPT. NO. FTD-HT-66-554

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. OF
UKRAYINSKYI FIZYCHNYI ZHURNAL (USSR), V11 N2 P217-8
1966.

DESCRIPTORS: (*LASERS, USSR), OPTICAL PROPERTIES,
MODULATION, RESONATORS, CRYSTALS, RUBY,
DIELECTRIC FILMS, RODS (U)
IDENTIFIERS: Q-SWITCHING, TRANSLATIONS (U)

IN EARLIER EXPERIMENTS Q SWITCHING WAS USUALLY
EFFECTED BY INTERRUPTING THE COUPLING BETWEEN THE
ACTIVE ROD AND ONLY ONE RESONATOR MIRROR; THE REPORT
INVESTIGATES THE PROPERTIES OF A LASER IN WHICH THE
COUPLING WITH BOTH MIRRORS IS INTERRUPTED. AN
ESTIMATE SHOWS THAT THE GAIN CAN BE INCREASED IN THIS
CASE TO ALMOST THE THEORETICAL 50%. TWO VARIANTS
OF SUCH A LASER WERE TESTED. TWO RUBY CRYSTALS
EACH 24 CM LONG AND 1.25 CM IN DIAMETER WERE USED.
ONE CRYSTAL OPERATED IN THE Q-SWITCHING MODE.
THE ENDS OF THE CRYSTALS AND THE HYPOTENUSE FACES
OF THE TOTAL-REFLECTION PRISMS WERE COATED WITH
MGF2 AND CAF2 FILMS, RESPECTIVELY. THE
RESONATOR COMPRISED ALTERNATING DIELECTRIC COATINGS
OF CAF2 AND ZNS ON PLATE GLASS AND THE PRISM.
THE PLATE WAS ROTATED AT 12,000 RPM. THE FOCUSED
GIANT PULSE PRODUCED BREAKDOWN IN AIR.

(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-666 434 20/5
ILLINOIS UNIV URBANA ANTENNA LAB

COHERENCE OF LASER RADIATION. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
DEC 67 54P BAYAZIT, YASAR NABI ;
REPT. NO. TR-14, UIAL-67-9
CONTRACT: AF 19(628)-3819
PROJ: AF-5635
TASK: 563502
MONITOR: AFCRL 68-0035

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, *COHERENT RADIATION),
INTERFEROMETERS, LIGHT TRANSMISSION, MONOCHROMATIC
LIGHT, PHOTOMULTIPLIERS, HELIUM, NEON, OPTICAL
PROPERTIES (U)
IDENTIFIERS: FABRY-PEROT RESONATORS (U)

THIS REPORT IS INTENDED TO BE A STUDY OF SOME OF
THE ASPECTS OF THE COHERENCE PROPERTIES OF OPTICAL
FIELDS AS THEY PROPAGATE THROUGH CERTAIN TYPE OF
MEDIA. A MAJOR PART OF THIS REPORT DEALS WITH THE
RESPONSE OF A FABRY-PEROT RESONATOR TO VARIOUS
TYPES OF EXCITATION. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-668 713 20/6

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

INFRARED HETERODYNE DETECTION.

(U)

DESCRIPTIVE NOTE: JOURNAL ARTICLE,

OCT 67 11P TEICH, MALVIN C. ;

REPT. NO. JA-3078

CONTRACT: AF 19(628)-5167

MONITOR: ESD TR-68-45

UNCLASSIFIED REPORT

AVAILABILITY: PUBLISHED IN PROCEEDINGS OF THE

IEEE, V56 N1 P37-46 JAN 1968.

SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 10 AUG 67.

DESCRIPTORS: (*INFRARED RADIATION, DETECTION),
GAS LASERS, IRASERS, CARBON DIOXIDE, INFRARED
DETECTORS, INFRARED PHOTOCONDUCTORS, PHOTODIODES,
CRYOGENICS, OPDAR, INFRARED COMMUNICATION SYSTEMS,
INFRARED SPECTROSCOPY, OPTIMIZATION

(U)

IDENTIFIERS: *HETERODYNE DETECTION, INFRARED
RADAR

(U)

HETERODYNE EXPERIMENTS HAVE BEEN PERFORMED IN THE
MIDDLE INFRARED REGION OF THE ELECTROMAGNETIC
SPECTRUM USING THE CO₂ LASER AS A RADIATION SOURCE.
THEORETICALLY OPTIMUM OPERATION HAS BEEN ACHIEVED
AT KHZ HETERODYNE FREQUENCIES USING PHOTOCONDUCTIVE
GE:CU DETECTORS OPERATED AT 4K, AND AT KHZ
AND MHZ FREQUENCIES USING PHOTOVOLTAIC DETECTORS AT
77K. IN ACCORDANCE WITH THE THEORY, THE MINIMUM
DETECTABLE POWER OBSERVED IS A FACTOR OF $2/\eta$
GREATER THAN THE THEORETICALLY PERFECT QUANTUM
COUNTER. THE COEFFICIENT $2/\eta$ VARIES FROM 5 TO 25
FOR THE DETECTORS INVESTIGATED IN THIS STUDY. A
COMPARISON IS MADE BETWEEN PHOTOCONDUCTIVE AND
PHOTODIODE DETECTORS FOR HETERODYNE USE IN THE
INFRARED, AND IT IS CONCLUDED THAT BOTH ARE USEFUL.
HETERODYNE DETECTION AT 10.6 MICROMETERS IS
EXPECTED TO BE USEFUL FOR COMMUNICATIONS
APPLICATIONS, INFRARED RADAR, AND HETERODYNE
SPECTROSCOPY. IT HAS PARTICULAR SIGNIFICANCE
BECAUSE OF THE HIGH RADIATION POWER AVAILABLE FROM
THE CO₂ LASER, AND BECAUSE OF THE 8 TO 14
MICROMETER ATMOSPHERIC WINDOW. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-669 086 17/5 20/5
ILLINOIS UNIV URBANA GASEOUS ELECTRONICS LAB

DYNAMICS OF OPTICAL MIXING IN A HE-NE LASER, (U)

FEB 68 42P MILLER, P. S. ; CHERRINGTON,
B. E. ; VERDEYEN, J. T. ;
CONTRACT: AF 33(615)-5248
PROJ: AF-7073
TASK: 707303
MONITOR: ARL 68-0033

UNCLASSIFIED REPORT

DESCRIPTORS: (*INFRARED DETECTORS, GAS LASERS),
(*GAS LASERS, ATOMIC ENERGY LEVELS), HELIUM,
NEON, BANDWIDTH, AMPLITUDE MODULATION,
EXCITATION, RESPONSE, PERTURBATION THEORY,
MATHEMATICAL PREDICTION (U)
IDENTIFIERS: OPTICAL MIXING, RESPONSE TIME,
COMPUTER ANALYSIS (U)

THE DIFFERENCE FREQUENCY BETWEEN TWO 3.39 MICRON
SIGNALS INJECTED INTO A 6328 A AND/OR 1.15 MICRON
HE-NE LASER HAS BEEN DETECTED AS AN AMPLITUDE
MODULATION OF THE 6328 A AND/OR 1.15 MICRON OUTPUT
INTENSITY. EXPERIMENTAL MEASUREMENTS OF THE
BANDWIDTH OF THIS DETECTION SCHEME HAVE BEEN MADE FOR
A 6328 A LASER DETECTOR. IT IS SHOWN THAT THE
FUNDAMENTAL EQUATIONS OF LASER ACTION PROPERLY
PREDICT THE BEHAVIOR OF THE LASER DETECTOR AND
INDICATE THE OPERATING CONDITIONS WHICH ARE NECESSARY
IN ORDER TO ACHIEVE OPTIMUM BANDWIDTH. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-669 305 20/5

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

LIGHT - DETECTOR AND WEAPON.

(U)

NOV 67 92P KRASNOV, V. ;
REPT. NO. FTD-HT-23-809-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. OF MONO.
SVET - LOKATOR, SVET - ORUZHIE, MOSCOW, 1964 P1-
103.

DESCRIPTORS: (*LASERS, USSR), QUANTUM MECHANICS,
VISIBILITY, COHERENT RADIATION, INSTRUMENTATION,
RUBY, PULSE SYSTEMS, GAS LASERS,
PUMPING(OPTICAL), DEMODULATION,
MAPS(PLANET), COMMUNICATION EQUIPMENT,
GYROSCOPES, PREDICTIONS

(U)

A BEAM OF LIGHT FROM A QUANTUM GENERATOR IS A
MILLION TIMES BRIGHTER THAN THE SUN AT THE SAME SOLID
ANGLE. HAVING A HIGH CONCENTRATION OF ENERGY, THE
BEAM OF A QUANTUM GENERATOR CAN EASILY PIERCE A THICK
METAL PLATE, EVEN A DIAMOND. FOCUSED INTO A NEEDLE
BEAM, THE WEAPON BECOMES A DEADLY WEAPON. USING
THE BEAMS OF A QUANTUM GENERATOR, DIRECT
COMMUNICATION WITH THE PLANETS AND THE STARS CAN BE
ACHIEVED. SUCCESSFUL EXPERIMENTS WITH LIGHT-
COMMUNICATIONS HAVE BEEN CONDUCTED ON EARTH.
QUANTUM GENERATORS CAN BE USED ALSO AS OPTICAL
LOCATORS. IN RANGE AND ACCURACY THEY ARE FAR
BETTER THAN RADAR. IN 1962 OPTICAL DETECTION OF
THE MOON WAS MADE. IT BECAME POSSIBLE TO EXAMINE
IN DETAIL THE LUNAR SURFACE AND, IN THE FUTURE, OTHER
PLANETS OF THE SOLAR SYSTEM. THE TREMENDOUS
DENSITY OF THE ENERGY OF THE NEW BEAMS PERMIT THEIR
WIDE USE IN VARIOUS TECHNOLOGIES. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-670 120 20/5
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

QUANTUM RADIOPHYSICS: SELECTED ARTICLES. (U)

SEP 67 87P
REPT. NO. FTD-MT-67-31

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF AKADEMIYA
NAUK SSSR. FIZICHESKII INSTITUT. TRUDY, V31 P74-
112, 139-77 1965.

DESCRIPTORS: (*LASERS, REPORTS), ATOMIC ENERGY
LEVELS, LIGHT COMMUNICATION SYSTEMS, GAS LASERS,
MASERS, PULSE SYSTEMS, MOLECULAR BEAMS,
HYDROGEN, RUBY, EXCITATION, COHERENT RADIATION,
USSR (U)

IDENTIFIERS: TRANSLATIONS, QUANTUM ELECTRONICS,
ATOMIC BEAMS, COMPUTER ANALYSIS, FREQUENCY
STANDARDS (U)

CONTENTS: REGENERATIVE OPTICAL QUANTUM
AMPLIFIERS; CONDITIONS OF PULSATIONS OF EMISSION
POWER OF QUANTUM GENERATORS; QUESTIONS OF
CONSTRUCTION AND INVESTIGATION OF WORK OF QUANTUM
GENERATOR ON BEAM OF HYDROGEN ATOMS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-671 596 17/2 20/5
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

FREQUENCY-SHIFT KEYING LASER COMMUNICATION
STUDIES.

(U)

DESCRIPTIVE NOTE: DOCTORAL THESIS,
APR 68 144P SMITH, DONALD A. I
REPT. NO. ECOM-2967
PROJ: DA-1L0-13001-A91A
TASK: 1L0-13001-A91A-56

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS, GAS
LASERS), (*GAS LASERS, *FREQUENCY SHIFT KEYERS),
(*MODULATORS, GAS LASERS), HELIUM, NEON,
DIGITAL SYSTEMS, FREQUENCY MODULATION,
ELECTROOPTICS, POTASSIUM COMPOUNDS, BIREFRINGENCE,
POLARIZATION, MATRIX ALGEBRA, SIGNAL-TO-NOISE
RATIO, DIAGRAMS, THESES

(U)

IDENTIFIERS: POTASSIUM DIHYDROPHOSPHATE, *LASER
MODULATORS

(U)

A UNIQUE OPTICAL MODULATION AND DETECTION TECHNIQUE
HAS EVOLVED FROM AN INVESTIGATION OF METHODS OF
DIGITAL MODULATION, TRANSMISSION, AND DETECTION IN
THE OPTICAL REGION. IN PARTICULAR A FREQUENCY-
SHIFT KEYING LASER COMMUNICATION SYSTEM HAS BEEN
DEMONSTRATED AND THE ADVANTAGES OF SUCH A SYSTEM HAVE
BEEN SHOWN. A DETAILED THEORETICAL ANALYSIS OF
ELECTROMAGNETIC-WAVE PROPAGATION IN AN ELECTROOPTIC
CRYSTAL OF ARBITRARY ORIENTATION WAS DEVELOPED. IN
TURN THE PARAMETERS FOR AN OPTICAL MODULATOR CAPABLE
OF FREQUENCY-SHIFT KEYING AT A DIGITAL RATE WERE
DETERMINED. BASED ON THIS ANALYSIS A LABORATORY
COMMUNICATION SYSTEM INCORPORATING FSK MODULATION
AND DETECTION CAPABILITIES WAS BUILT AND SUCCESSFULLY
OPERATED. THE TRANSMITTER CONSISTS OF TWO HELIUM-
NEON GAS LASERS OPERATING AT WAVELENGTHS OF 6328
ANGSTROMS AND 11523 ANGSTROMS. THE TWO BEAMS
ARE COMBINED AND PASS THROUGH THE KDP ELECTRO-OPTIC
MODULATOR WHICH IS DRIVEN BY A DIGITAL VOLTAGE OF 100
VOLTS PEAK AMPLITUDE. THE RECEIVER CONSISTS OF TWO
PHOTODIODES, EACH DETECTING ONE OF THE WAVELENGTHS.
THE DETECTED SIGNALS ARE PROCESSED BY DECISION
CIRCUITRY TO RETRIEVE THE TRANSMITTED INFORMATION.
TO EVALUATE THE PERFORMANCE OF AN OPTICAL FSK
SYSTEM, ERROR RATE MEASUREMENTS WERE MADE IN A
SIMULATED ATMOSPHERIC TYPE OF ENVIRONMENT AND
COMPARED TO SIMILAR MEASUREMENTS MADE

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-672 301 17/2 20/6
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J INST FOR
EXPLORATORY RESEARCH

SELF-ALIGNING OPTICAL BEAM WAVEGUIDES, (U)

67 6P CHRISTIAN, J. ROBERT ; GOUBAU,
GEORG ; MINK, J. W. ;

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN IEEE JNL. OF QUANTUM
ELECTRONICS, VQE3 N11 P498-503 NOV 1967.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
WAVEGUIDES), (*LENSES, ALIGNMENT), LASERS,
OPTICAL COATINGS, CONTROL SYSTEMS,
TOLERANCES (MECHANICS), SEISMOLOGY (U)
IDENTIFIERS: QUANTUM ELECTRONICS, AUTOMATIC
CONTROL SYSTEMS, COMPUTER ANALYSIS (U)

PREVIOUS EXPERIMENTS WITH A LENS-TYPE BEAM
WAVEGUIDE HAVE DEMONSTRATED THE APPLICABILITY OF SUCH
GUIDES TO EFFICIENT LONG DISTANCE TRANSMISSION AT
OPTICAL FREQUENCIES. IN PRACTICAL APPLICATIONS IT
WILL BE NECESSARY TO AUTOMATICALLY COMPENSATE FOR
MOVEMENTS OF THE GROUND WHICH WOULD MISALIGN THE
GUIDE AND THUS CAUSE INCREASED TRANSMISSION LOSS.
IN ORDER TO INVESTIGATE THE PRACTICABILITY OF
'SELF-ALIGNING' OPTICAL BEAM WAVEGUIDES THE AVAILABLE
EXPERIMENTAL GUIDE WAS MODIFIED BY ADDING A SENSING
DEVICE AT EACH LENS WHICH INDICATES ANY DISPLACEMENT
OF THE BEAM FROM THE LENS CENTER. THIS ALIGNMENT
ACCURACY COULD BE GREATLY INCREASED, WHICH MIGHT BE
OF INTEREST FOR GEOLOGICAL MEASUREMENTS CONCERNING
MOVEMENTS IN THE EARTH'S CRUST. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-672 693 20/6 20/5 17/2
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

INVESTIGATION AND DEVELOPMENT OF OPTICAL MODULATORS
(ISSLEDOVANIIE I RAZRABOTKA OPTICHESKIKH
MODULYATOROV), (U)

OCT 67 12P PIRSHIN, I. V. ; KOBLOVA, M.
M. ; KHLYSTOV, V. I. ; ANTONYANTS, E. V. ;
REPT. NO. FT -MT-24-222-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF MONO.
VSESOYUZNAYA NAUCHNAYA SESSIYA, POSVYASHENNAYA
DNYU RADIO (NO. 22): SEKTSIYA KVANTOVOI
ELEKTRONIKI (SCIENTIFIC AND TECHNICAL SOCIETY OF
RADIO ENGINEERING AND ELECTRICAL COMMUNICATION.
CENTRAL GOVERNMENT 22 ALL-UNION SCIENTIFIC
SESSION, DEDICATED TO RADIO DAY. SECTION OF
QUANTUM (ELECTRONICS), MOSCOW, 1966 P33-40.

DESCRIPTORS: (*LASERS, *MODULATORS), (*LIGHT
COMMUNICATION SYSTEMS, MODULATORS),
INTERFEROMETERS, CRYSTALS, POTASSIUM COMPOUNDS,
PHOSPHATES, POWER, OPTIMIZATION, THERMAL
EXPANSION, MODULATION, TELEVISION COMMUNICATION
SYSTEMS, USSR (U)

IDENTIFIERS: *OPTICAL MODULATORS, *LASER
COMMUNICATION SYSTEMS, ELECTRO-OPTICAL SYSTEMS,
TRANSLATIONS (U)

A DEVICE USING A SYMMETRICAL MICHAELSON
INTERFEROMETER WITH DOUBLE REFLECTING DIAGONALLY CUT
CRYSTALS IN THE ARMS WAS DEVELOPED. THE LATTER ARE
CONTROLLED BY A FIELD AT RIGHT ANGLES TO THE
DIRECTION OF PROPAGATION. THE POWER REQUIRED TO
CONTROL THE MODULATOR CAN BE LOWERED BY INCREASING
THE LENGTH OF THE CRYSTAL AND DECREASING ITS CROSS
SECTION. DETAILS ON THE THERMAL EXPANSION OF
VARIOUS PARTS AND MATERIALS ARE GIVEN AND THE EFFECTS
OF EXPANSION ON MODULATOR OPERATION ARE DESCRIBED.
THE MODULATOR WAS TESTED BETWEEN 0 AND 100 MC
WITH A CONTROL VOLTAGE OF 15 V. THE MODEL WAS
TESTED IN AN EXPERIMENTAL TRANSMISSION OF A
TELEVISION PICTURE WITH THE AID OF A LASER BEAM. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-672 955 20/5 20/6 17/2
RAND CORP SANTA MONICA CALIF

ELECTROMAGNETIC FIELD AND INTENSITY FLUCTUATIONS IN A
WEAKLY INHOMOGENEOUS MEDIUM, (U)

JUL 68 40P YURA, H. T. ;
REPT. NO. RM-5697-PR
CONTRACT: F44620-67-C-0045

UNCLASSIFIED REPORT

DESCRIPTORS: (*ELECTROMAGNETIC FIELDS,
PROPAGATION), (*COHERENT RADIATION,
PROPAGATION), (*LIGHT COMMUNICATION SYSTEMS,
SCATTERING), REFRACTIVE INDEX, LASERS,
TURBULENCE, GREEN'S FUNCTION, PERTURBATION THEORY,
RADAR (U)
IDENTIFIERS: RYTOV APPROXIMATION, MAXWELL'S
EQUATIONS, WAVE EQUATIONS (U)

A SELF-CONSISTENT GREEN'S FUNCTION TECHNIQUE IS
USED TO OBTAIN THE ELECTROMAGNETIC FIELD AND ITS
CORRESPONDING INTENSITY TO SECOND ORDER IN THE INDEX
OF REFRACTION FLUCTUATIONS. IT IS FOUND THAT FOR
PROPAGATION DISTANCES LESS THAN A CRITICAL LENGTH,
THE PERTURBATION METHOD GIVES VALID RESULTS. THE
FIELD IS PRIMARILY COHERENT SINCE THE FLUCTUATIONS IN
THE FIELD ARE SMALL. THE SOLUTION OBTAINED FOR THE
FIELD IS ALSO SHOWN TO CONSERVE ENERGY. WHEN THE
SOLUTION OBTAINED HERE IS COMPARED WITH THE RESULTS
OF THE RYTOV APPROXIMATION, IT IS CONCLUDED THAT
THE RYTOV APPROXIMATION IS NOT VALID FOR
PROPAGATION DISTANCES EXCEEDING THE CRITICAL LENGTH.
FOR THESE DISTANCES, THE PERTURBATION METHOD BREAKS
DOWN; THE FIELD IS ESSENTIALLY INCOHERENT SINCE THE
COHERENT COMPONENT OF THE FIELD IS EXPONENTIALLY
SMALL. FOR THESE RANGE VALUES, A STATISTICAL
ARGUMENT IS GIVEN TO OBTAIN INTENSITY STATISTICS. AND
AN APPROXIMATE EXPRESSION VALID FOR ALL RANGE VALUES
IS DERIVED FOR THE INTENSITY STATISTICS. THIS
EXPRESSION IS FOUND TO BE IN GOOD AGREEMENT WITH
EXPERIMENT. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-673 759 20/5
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

RECENT FOREIGN DEVELOPMENTS IN LASER TECHNOLOGY: (U)

AUG 67 26P HUANG WU-HAN,;
REPT. NO. FTD-HT-67-216

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF K'O HSUEH T'UNG
PAO (CHINESE PEOPLE'S REPUBLIC) N2 P166-174
1965.

DESCRIPTORS: (*LASERS, REVIEWS), MATERIALS,
INSTRUMENTATION, RANGE FINDING, OPDAR, LIGHT
COMMUNICATION SYSTEMS, INFRARED DETECTORS, CHINA (U)
IDENTIFIERS: TRANSLATIONS (U)

A REVIEW IS GIVEN OF NON-CHINESE LASER
TECHNOLOGY. TOPICS INCLUDE: THE SEARCH FOR
LASING MATERIALS; IMPROVEMENT OF LASER SYSTEMS AND
APPARATUS; HIGH-INTENSITY OPTICS; APPLICATION OF
LASER TECHNIQUES (OPTICAL LOCATING, OPTICAL RADAR,
INFRARED RECEIVING). (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-673 876 17/2 20/5 22/2
AEROSPACE CORP EL SEGUNDO CALIF LAB OPERATIONS

DESIGN CONSIDERATIONS OF MULTIPLE LASER COMMUNICATION
LINKS BETWEEN SYNCHRONOUS SATELLITE AND SEVERAL EARTH
STATIONS, (U)

SEP 67 30P CHANG, N. C. ; BROCK, F. G.

REPT. NO. TR-0158(9230-02)-1
CONTRACT: F04695-67-C-0158
MONITOR: SAMSO TR-68-7

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, LIGHT COMMUNICATION
SYSTEMS), (*SYNCHRONOUS SATELLITES, *LIGHT
COMMUNICATION SYSTEMS), COMMUNICATION
SATELLITES(ACTIVE), TELESCOPES, STABILITY,
ATMOSPHERIC MOTION, SIGNAL-TO-NOISE RATIO, GAIN,
SPACE-TO-SURFACE, BANDWIDTH, SECRET COMMUNICATION
SYSTEMS (U)

SECURE AND PRIVATE MEGABIT-PER-SECOND COMMUNICATION
LINKS BETWEEN A SATELLITE IN SYNCHRONOUS ORBIT AND
SEVERAL GROUND STATIONS ARE DESIRED IN CERTAIN
APPLICATIONS. THE HIGHLY DIRECTIONAL PROPERTY OF
LASER BEAMS MAKES LASER WAVES AN APT CANDIDATE FOR
THE CARRIER OF THE SYSTEM. THE LARGE POTENTIAL
BANDWIDTH OF THE LASER SYSTEM CAN BE OF VALUE ALSO IN
PROVIDING REDUNDANCY FOR RELIABILITY AND CODING FOR
SECURITY. THE VERY DIRECTIONAL PROPERTY OF THE
LASER BEAM, HOWEVER, PRESENTS PROBLEMS OF POINTING
AND ACQUISITION. THESE PROBLEMS ARE PARTICULARLY
SEVERE FOR THE CASE OF SIMULTANEOUS TRANSMISSION
BETWEEN THE SATELLITE AND MULTIPLE GROUND TERMINALS.
AN ADDITIONAL PROBLEM OF EFFICIENT OPTICAL ANTENNA
GAIN ARISES FOR THIS CASE. RECENT ADVANCES IN
HIGH-POWER, HIGHER-EFFICIENCY LASERS ENCOURAGE
CONSIDERATION OF A LASER TRANSMITTER CONFIGURATION
NOT PREVIOUSLY INVESTIGATED FOR MULTIPLE LINK
COMMUNICATION OVER SYNCHRONOUS SATELLITE DISTANCES.
IN THIS CONFIGURATION, A SATELLITE-BORNE LASER IS
OPERATED IN A RELATIVELY HIGH-ORDER MODE.
APPROPRIATE OPTICS ARE USED TO PROVIDE MULTIPLE
LINKS, ONE LOBE OF THE BEAM FOR EACH LINK. ALSO
MODE SWITCHING CAN PROVIDE ALTERNATIVE LINKS. THE
GROUND TERMINALS ARE EACH EQUIPPED WITH SEPARATE
LASERS. ASIDE FROM POOR ATMOSPHERIC SEEING,
SATELLITE ATTITUDE STABILITY APPEARS TO BE THE KEY
PERFORMANCE-LIMITING ELEMENT OF THE SYSTEM. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-674 085 17/2 20/5 9/4
PENNSYLVANIA STATE UNIV UNIVERSITY PARK

SOME RESULTS ON ERROR RATES FOR A LASER BINARY
COMMUNICATION SYSTEM, (U)

JAN 68 4P LACHS, GERARD ; JANKOWICH,
EDWARD ;
CONTRACT: DA-31-124-ARO(D)-383
PROJ: DA-20014501831E
MONITOR: AROD 5659:7

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN PROCEEDINGS OF THE IEEE,
V56 N4 P744-745 APR 68.
SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 11 DEC
67.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
*LASERS), ERRORS, PROBABILITY, SIGNAL-TO-NOISE
RATIO, POWER (U)

THE PROBABILITY OF ERROR IS OBTAINED FOR A SIMPLE
BUT FUNDAMENTAL FORM OF A LASER BINARY COMMUNICATION
SYSTEM. THE RESULTS SHOW THAT THE PROBABILITY OF
ERROR IS STRONGLY DEPENDENT UPON ABSOLUTE SIGNAL
LEVEL AS WELL AS SIGNAL-TO-NOISE RATIO. (AUTHOR) (U)

UNCLASSIFIED

DOC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-674 170 17/2 20/14
ADVISORY GROUP FOR AERONAUTICAL RESEARCH AND DEVELOPMENT
PARIS (FRANCE)

PROPAGATION FACTORS IN SPACE COMMUNICATIONS. (U)

DESCRIPTIVE NOTE: CONFERENCE PROCEEDINGS,
67 553P BLACKBAND, W. T. I
REPT. NO. AGARD-CP-3

UNCLASSIFIED REPORT
AVAILABILITY: ADVISORY GROUP FOR AERONAUTICAL
RESEARCH AND DEVELOPMENT, 7 RUE ANCELLE, 92
NEUILLY-SUR-SEINE, PARIS (FRANCE).

DESCRIPTORS: (*SPACE COMMUNICATION SYSTEMS,
*PROPAGATION), SYMPOSIA, IONOSPHERIC
PROPAGATION, PLASMA SHEATH, REENTRY VEHICLES,
RADIO WAVES, TROPOSPHERE, IONOSPHERE,
ATMOSPHERIC REFRACTION, ATTENUATION, LASERS,
COMMUNICATION SATELLITES (ACTIVE) (U)
IDENTIFIERS: NATO (U)

THE IONOSPHERIC RESEARCH COMMITTEE OF THE
AVIONICS PANEL OF AGARD/NATO HELD ITS TENTH
ANNUAL SYMPOSIUM MEETING IN ROME 21-25 SEPTEMBER
1965. THE SUBJECT CHOSEN FOR DISCUSSION WAS
'PROPAGATION FACTORS IN SPACE COMMUNICATIONS'.
THIS VOLUME PRESENTS THE FULL TEXT OF THOSE PAPERS
WHICH HAVE NOT BEEN PRINTED ELSEWHERE AND ALSO AN
ACCOUNT OF THE INFORMAL DISCUSSIONS WHICH FOLLOWED
THE PRESENTATION OF THE PAPERS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-674 274 17/2 20/5
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

APPLICATIONS OF LASERS.

(U)

NOV 67 11P HSIANG CH'UN,
REPT. NO. FTD-HT-23-1024-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF K'G HSUEH HUA
FAO (CHINESE PEOPLE'S REPUBLIC) N1 P13-15 1963.

DESCRIPTORS: (*LASERS, LIGHT COMMUNICATION
SYSTEMS), (*COMMUNICATION SYSTEMS, CHINA),
OPDAR, SPACE COMMUNICATION SYSTEMS, MAPPING,
UNDERWATER COMMUNICATION SYSTEMS, LIGHT
TRANSMISSION, UNDERWATER TRACKING, ELECTRON
ACCELERATORS, DETECTION
IDENTIFIERS: TRANSLATIONS

(U)

(U)

LASERS CAN PRODUCE A LIGHT BEAM HAVING EXCELLENT
DIRECTIVITY AND AN INTENSITY SEVERAL MILLION TIMES
THE INTENSITY OF THE SUN. EXPERIMENTS PROVED THAT
LASER BEAMS HAVE A BEAM SPREAD LESS THAN 30 CM FOR
EVERY 1.5-KM PROPAGATION. RESEARCH IS UNDERWAY TO
USE LASERS IN SPACE, SURFACE, AND UNDERWATER
COMMUNICATIONS. LASERS WILL BE USED IN MILITARY
DETECTION, MAPPING, COMPUTING TECHNOLOGY, AND SPACE
NAVIGATION AND ALSO AS WEAPONS. WHEN LASERS ARE
USED IN COMMUNICATIONS, THE AUDIO SIGNALS TO BE
TRANSMITTED ARE USED TO MODULATE THE LIGHT BEAMS.
THE MODULATED BEAMS ARE THEN TRANSMITTED BY AN
OPTICAL TRANSMITTER. THE OPTICAL RECEIVER AT THE
RECEIVING END WILL RECEIVE AND DEMODULATE THE
INCOMING LIGHT SIGNALS. AN OPTICAL SYSTEM FOR
SPACE COMMUNICATIONS USING SOLAR ENERGY FOR LASER
PUMPING IS IN PROCESS OF DEVELOPMENT. OPTICAL
RADARS REQUIRE A LOWER INPUT POWER THAN MICROWAVE
RADARS. RESEARCH SHOWS THAT AN OPTICAL RADAR
HAVING AN AVERAGE OUTPUT POWER OF 56 W IS CAPABLE OF
DETECTING 2 SPACESHIPS 16,000 KM APART WITH AN
ACCURACY APPROACHING 1×0.0001 . A GROUND OPTICAL
RADAR HAVING A 10-KM DETECTING RANGE WEIGHS ONLY 10
KG. LASERS EMITTING BLUE LIGHT BEAMS ARE USED FOR
UNDERWATER TRACKING AND INTERSUBMARINE
COMMUNICATIONS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-674 349 17/2
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

CERTAIN DEMANDS ON THE OPTICAL FREQUENCY RECEIVERS IN
COMMUNICATION SYSTEMS USING COHERENT LIGHT, (U)

NOV 67 16P HENG, CH'EN ;
REPT. NO. FTD-HT-23-606-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF WU HSIFN TIEN
CHI SHU (CHINESE PEOPLE'S REPUBLIC) N11 P12-17
1965.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
DEMODULATION), LASERS, COHERENT RADIATION,
SEMICONDUCTOR DEVICES, SIGNAL-TO-NOISE RATIO,
PHOTOTUBES, PHOTOMULTIPLIERS, RESPONSE,
EFFICIENCY, BANDWIDTH, INFRARED DETECTORS,
CHINA

IDENTIFIERS: TRANSLATIONS, HETERODYNING

(U)
(U)

THE DEVELOPMENT OF THE LASER AS A COHERENT,
EXCELLENT MONOCHROMATIC AND HIGHLY DIRECTIONAL
OPTICAL SIGNAL SOURCE HAS LED TO ITS POSSIBLE
APPLICATION IN OPTICAL COMMUNICATION. THE OBJECT
OF THIS PAPER IS TO SET FORTH SOME SPECIAL
REQUIREMENTS OF LIGHT DEMODULATORS FOR COHERENT LIGHT
OPTICAL COMMUNICATION. LIGHT DEMODULATORS OPERATE
IN A MANNER SIMILAR TO RADIO RECEIVERS, EXCEPT THAT
THEY REQUIRE THE CONVERSION OF LIGHT INPUT TO
PHOTOCURRENT AND THEIR NOISE HAS STRONG QUANTUM
CHARACTERISTICS. GENERAL REQUIREMENTS FOR LIGHT
DEMODULATORS ARE HIGH SENSITIVITY AND A HIGH SIGNAL
TO NOISE RATIO. IN AN OPTICAL COMMUNICATION
SYSTEM, THE PREFERRED MODULATION FREQUENCIES AND BAND
WIDTHS ARE IN THE INFRA-RED RANGE AND HIGHER. SOME
SEMICONDUCTORS ARE PROMISING FOR USE IN DEMODULATORS
OPERATING IN THE INFRA-RED RANGE, BUT THEY DO NOT
COMPLETELY FULFILL THE OTHER REQUIREMENTS. AMONG
LIGHT DETECTION METHODS THAT CAN BE USED, OPTICAL
HETERODYNING APPEARS TO BE OF PARTICULAR IMPORTANCE. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

DA-675 075 2076
CALIFORNIA UNIV BERKELEY

PHASE MODULATION OF Q-SWITCHED LASER BEAMS IN SMALL-
SCALE FILAMENTS, (U)

FEB 68 7P CHEUNG, A. C. FRANK, D. M.
; CHIAO, R. Y. ; TOWNES, C. H. ;
CONTRACT: DA-ARO(D)-31-124-G976, ARPA ORDER-675
MONITOR: AROD 7778:1

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN PHYSICAL REVIEW LETTERS,
V20 N15 P786-789, 8 APR 68.

DESCRIPTORS: (*COHERENT RADIATION, *PHASE
MODULATION), CARBON COMPOUNDS, SULFIDES, LIGHT
PULSES, BAND SPECTRUM, REFRACTIVE INDEX, LASERS,
SIDEBANDS (U)
IDENTIFIERS: Q-SWITCHING, CARBON DISULFIDE (U)

THE SPECTRA OF SMALL-SCALE TRAPPED FILAMENTS OF
LASER LIGHT IN CARBON DISULFIDE AND OTHER LIQUIDS
CONTAIN DISCRETE BANDS OF FREQUENCIES EXTENDING TO
EITHER SIDE OF THE LASER FREQUENCY. THE REGULARITY
OF THESE PATTERNS, AND YET THE LACK OF A FIXED
FREQUENCY BETWEEN BANDS AS EXPECTED FOR VARIOUS
MODULATION PROCESSES, HAVE BEEN PUZZLING. IT IS
FOUND THAT THE PATTERNS OBSERVED CORRESPOND TO THE
INTENSITY ENVELOPE OF AN UNDERLYING STRUCTURE OF
EQUALLY SPACED SIDEBANDS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-676 721 7/4 17/2
TECHNION - ISRAEL INST OF TECH HAIFA DEPT OF PHYSICS

DETERMINATION OF THE CO2 LINE PARAMETERS USING A
CO2-N2-HE LASER, (U)

NOV 67 3P OPPENHEIM, URI P. ;DEVIR,
ADAM D. ;
CONTRACT: AF-EOAR-26-67
MONITOR: AFOSR 68-2119

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN JNL. OF THE OPTICAL
SOCIETY OF AMERICA, V58 N4 P585-586 APR 68.

DESCRIPTORS: (*CARBON DIOXIDE, ABSORPTION
SPECTRUM), (*MOLECULAR ENERGY LEVELS, CARBON
DIOXIDE), (*LIGHT COMMUNICATION SYSTEMS,
ATTENUATION), BAND SPECTRUM, IRASERS, INFRARED
RADIATION, LINE SPECTRUM, INFRARED SPECTROSCOPY,
ATMOSPHERE, NITROGEN, HELIUM, ISRAEL (U)
IDENTIFIERS: ATMOSPHERIC ABSORPTION (U)

THE INTEGRATED INTENSITY AND WIDTH OF SINGLE
ROTATIONAL LINES IN MOLECULAR BAND SPECTRA ARE
IMPORTANT FACTORS IN THE DETERMINATION OF SPECTRAL
EMISSIONS. THE RESULTS GIVEN IN THIS REPORT
ALLOW PREDICTION OF LONG-PATH ATMOSPHERIC ABSORPTION
OF CO2 LASER ENERGY. FOR EXAMPLE, A 10-M PATH OF
PURE CO2 IS EQUIVALENT TO 30 KM OF AIR, IF A
CONCENTRATION OF 0.033% OF CO2 IS ASSUMED.
THUS FIG. 1 SHOWS THE ATTENUATION OF LASER
RADIANT ENERGY IN A 30-KM PATH IN AIR, IF THE SAME
PRESSURE BROADENING IN AIR IS ASSUMED AS IN PURE
CO2. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-676 814 17/2 20/5
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

ATMOSPHERIC EFFECTS ON DIGITALLY MODULATED LASER
TRANSMISSION. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JUL 68 21P WHATLEY, MERLE M. SMITH,
DONALD A. I
REPT. NO. ECOM-3005
PROJ: DA-1-H-620501-A-448
TASK: 1-H-620501-A-44806

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
*LASERS), PULSE CODE MODULATION, ATMOSPHERE,
METEOROLOGICAL PARAMETERS, TACTICAL WARFARE,
DIGITAL SYSTEMS, ERRORS, AMPLITUDE MODULATION,
SCINTILLATION (U)
IDENTIFIERS: POLARIZATION MODULATION (U)

THIS INVESTIGATION HAS PROVIDED DATA WHICH ALLOW
THE EVALUATION OF THE LASER AS A TRANSMISSION DEVICE
FOR DIGITAL INFORMATION. IN PARTICULAR, THE EFFECT
OF THE ATMOSPHERE ON LASER PROPAGATION, MODULATION,
AND COMMUNICATION CAPABILITIES PERTINENT TO TACTICAL
APPLICATIONS HAS BEEN STUDIED. THESE STUDIES WERE
MADE UNDER VARYING CONDITIONS OF WEATHER, PATH
LENGTH, OPTICAL POWER, MODULATION DEPTH AND
MODULATION METHOD. THE CHARACTERISTICS OF INTEREST
IN EACH CASE WAS THE BIT-ERROR RATE OBTAINED WITH
BINARY SERIAL BIT STREAMS. FROM THIS INFORMATION,
THE OPERATION OF A LASER PCM SYSTEM MAY BE
FORECAST. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-677 221 20/5

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

MORE POWERFUL THAN THE HYPERBOLOID,

(U)

DEC 67 9P ANDREEV, O. ;
REPT. NO. FTD-HT-23-1696-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF VOENNYE ZNANIYA
(USSR) V41 N2 P38-39 1965, BY L. HEENAN.

DESCRIPTORS: (*LASERS, REVIEWS), COHERENT
RADIATION, LIGHT COMMUNICATION SYSTEMS,
EXTRATERRESTRIAL RADIO WAVES, MIRRORS, FOCUSING,
HEAT, USSR

(U)

IDENTIFIERS: DEATH RAYS, HYPERBOLOIDS, PLASMA
DIAGNOSTICS, TRANSLATIONS

(U)

MANY PRE-WORLD WAR II SOVIET PUBLICATIONS
CARRIED ARTICLES ON THE SO-CALLED 'DEATH RAYS.'
MORE OFTEN THAN NOT, THESE ARTICLES, BASED LARGELY
ON NON-SOVIET DATA, WERE PURE SCIENCE FICTION.
THE FEW SERIOUS ARTICLES REFERRED TO DEADLY WEAPONS
USING HEAT RAYS. THE CONCEPT OF WEAPONRY CHANGED
DRASTICALLY WITH THE ADVENT OF LASERS, WHICH EMIT
STIMULATED RATHER THAN THERMAL RADIATION. MENTION
IS MADE OF THE USE OF LASERS IN MULTICHANNEL
COMMUNICATION SYSTEMS, RANGING OF PLANETARY SURFACES,
METALLURGY, PLASMA DIAGNOSTICS, BIOLOGY, MEDICINE,
ETC. THE ARTICLE ALSO REVIEWS SOVIET
CONTRIBUTIONS TO THE DEVELOPMENT OF THE LASER.

(U)

UNCLASSIFIED

DD. REF. & BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-677 374 9/1 17/2
MICHIGAN UNIV ANN ARBOR ELECTRON PHYSICS LAB

E-TYPE PHOTODEMODULATORS FOR COHERENT LIGHT
SIGNALS.

(U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPORT,
AUG 68 47P MASON, JOHN L. ;
REPT. NO. TR-111, 07094-1-F
CONTRACT: DA-ARO(D)-31-124-G630
PROJ: DA-20014501-B-31-E, 07094
MONITOR: AROD 5427:4-E

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
PHOTOTUBES), (*PHOTOTUBES, DEMODULATORS),
DESIGN, S BAND, COHERENT RADIATION, LASERS,
TRAVELING-WAVE TUBES, RESISTANCE(ELECTRICAL),
ELECTRON BEAMS, ELECTROSTATIC FIELDS, FOCUSING
IDENTIFIERS: *PHOTODEMODULATORS

(U)

(U)

THE THEORETICAL STUDIES ARE SUMMARIZED AND AN
EXPERIMENTAL INVESTIGATION IS REPORTED FOR AN E-
TYPE TRAVELING-WAVE PHOTOTUBE. THE PRINCIPAL
FEATURE OF SUCH A DEVICE IS THE CENTRIFUGAL
ELECTROSTATIC FOCUSING OF THE ELECTRON BEAM. THE
THEORETICAL STUDY YIELDS A SMALL-SIGNAL POWER
THEOREM, THE TYPES OF WAVES PROPAGATING ALONG A THIN
E-TYPE BEAM, AND A SMALL-SIGNAL ANALYSIS OF THE
TRAVELING-WAVE PHOTOTUBE. AN EXPRESSION FOR THE
EQUIVALENT RESISTANCE OF THE DEVICE IS DERIVED, WITH
NUMERICAL RESULTS GIVEN FOR THE CASE OF ZERO CIRCUIT
LOSS, ZERO SPACE CHARGE, AND SYNCHRONOUS BEAM
VELOCITY. FOR COMPARISON, EQUIVALENT RESISTANCE
VALUES ARE GIVEN FOR O-TYPE PHOTOTUBES. THE
EXPERIMENTAL INVESTIGATION INVOLVED A PHOTOTUBE
DESIGNED TO OPERATE AT S-BAND. DESIGN
CONSIDERATIONS AND MEASUREMENT TECHNIQUES ARE
DISCUSSED. EXPERIMENTAL CURVES FOR THE EQUIVALENT
RESISTANCE ARE PRESENTED AND COMPARED WITH THE
THEORETICAL RESULTS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-679 202 20/5
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

NEWS OF INSTITUTIONS OF HIGHER LEARNING.
PHYSICS, VOLUME 10, NUMBER 8, 1967 (SELECTED
ARTICLES),

(U)

MAY 68 17P KABANOV, M. V. !BUKATYI, V.

I. ;

REPT. NO. FTD-HT-23-251-68

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF IZVESTIYA
VYSSHIKH UCHEBNYKH ZAVEDENII. FIZIKA (USSR) V10
N8 P26-30, 142-144 1967, BY F. DION.

DESCRIPTORS: (*LASERS, *LIGHT TRANSMISSION),
ATMOSPHERE, LIGHT COMMUNICATION SYSTEMS,
SCATTERING, FOG, ATTENUATION, USSR
IDENTIFIERS: TRANSLATIONS

(U)

(U)

CONTENTS: ATTENUATION OF COLLIMATED LIGHT BEAMS
IN DISPERSIVE MEDIA; ATTENUATION OF LASER BEAMS IN
ARTIFICIAL WATER FOGS.

(U)

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-680 574 17/2 20/5
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

LIGHT RAYS THAT CARRY INFORMATION. (U)

MAY 68 14P EIDUS, YA. :
REPT. NO. FTD-HT-23-1544-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF NAUKA I TEKHNIKA
(USSR) N11 P5-9 1966, BY R. ZECCOLA.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
*LASERS), (*LIGHT, MODULATION),
ELECTROOPTICS, BANDWIDTH, PUMPING(OPTICAL),
MAGNETO-OPTIC EFFECT, BIREFRINGENCE, PIEZOELECTRIC
CRYSTALS, USSR (U)
IDENTIFIERS: TRANSLATIONS, OPTICAL MODULATORS (U)

THE EVER-EXPANDING NEED FOR EXCHANGE OF INFORMATION HAS CROWDED THE RADIO FREQUENCY SPECTRUM. A QUALITATIVELY NEW SOLUTION TO THE PROBLEM OF CHANNEL CAPACITY IS OFFERED BY THE RECENTLY CREATED SOURCES OF MONOCHROMATIC COHERENT LIGHT. THESE SO-CALLED MASERS AND LASERS OPERATE AT EXTREMELY HIGH FREQUENCIES, AND, SINCE THE QUANTITY OF INFORMATION THEORETICALLY ABLE TO BE TRANSMITTED ON A COMMUNICATIONS CHANNEL IS DIRECTLY PROPORTIONAL TO THE FREQUENCY, THEIR THEORETICAL INFORMATION CAPACITY IS TREMENDOUS. THE CAPACITY OF A LASER COMMUNICATIONS CHANNEL IS AT LEAST 1000 TIMES GREATER THAN THE CAPACITY OF ALL RADIO CHANNELS USED UP TO NOW, INCLUDING MICROWAVE. THE PRIMARY PROBLEM HINDERING LASER COMMUNICATIONS NOW IS MODULATION OF THE LASER BEAM. THEORETICALLY, ANY OF THE FOUR STANDARD PARAMETERS OF A LASER BEAM CAN BE MODULATED TO PLACE INFORMATION OF THE BEAM: FREQUENCY, AMPLITUDE, PHASE AND POLARIZATION. ACTUALLY, TWO PRIMARY METHODS CAN BE USED TO MODULATE THE LIGHT BEAM EXITING FROM A LASER: INTERNAL AND EXTERNAL METHODS. IN THE FIRST CASE, THE LIGHT BEAM IS ACTED UPON AS IT IS BEING FORMED, I.E., WITHIN THE ACTUAL LASER. IN THE SECOND CASE, THE MODULATION IS PERFORMED AFTER THE BEAM HAS BEEN CREATED. INTERNAL METHODS INCLUDE REGENERATION MODULATION, MODULATION USING THE STARK EFFECT AND MODULATION USING THE SEEMAN EFFECT. SCIENTISTS AT PRESENT ARE GIVING PREFERENCE TO THE EXTERNAL MODULATION METHODS, WHICH INCLUDE MODULATION OF THE PUMPING, MECHANICAL MODULATION, MODULATION USING THE FARADAY EFFECT, MODULATION USING THE KERR EFFECT (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-682 079 20/6
SIGNALS RESEARCH AND DEVELOPMENT ESTABLISHMENT
CHRISTCHURCH (ENGLAND)

A LOW DRIVE-POWER LIGHT MODULATOR USING A READILY
AVAILABLE MATERIAL ADP, (U)

MAY 68 16P DORE, M. ;
REPT. NO. SRDE-68009

UNCLASSIFIED REPORT

DESCRIPTORS: (*ELECTROOPTICS, MODULATION),
(*MODULATORS, LIGHT), LIGHT COMMUNICATION
SYSTEMS, LASERS, AMMONIUM COMPOUNDS, PHOSPHATES,
BANDWIDTH, LIGHT TRANSMISSION, BIREFRINGENCE,
GREAT BRITAIN (U)
IDENTIFIERS: AMMONIUM DIHYDROGEN PHOSPHATE (U)

A VIDEO-FREQUENCY TRANSVERSE ELECTROOPTIC LIGHT
AMPLITUDE MODULATOR UTILIZING THE MATRIX ELEMENT R41
IN ADP IS DESCRIBED AND COMPARED FAVORABLY WITH
OTHER MODULATOR CONFIGURATIONS USING ADP, KDP,
AND KD*P. IT UTILIZES TWO CRYSTALS TO COMPENSATE
FOR TEMPERATURE AND ANGULAR DEPENDENCES OF
BIFRINGENCE, AND HAS MORE THAN ADEQUATE STABILITY FOR
NORMAL LABORATORY USE. A USEFUL BUILT-IN OPTICAL
BIAS CONTROL IS PROVIDED. FREQUENCY RESPONSE HAS
BEEN MEASURED BETWEEN 50 HZ AND 5 MHZ AND FOUND
TO BE FLAT. VIDEO SIGNALS HAVE BEEN TRANSMITTED
OVER A LASER COMMUNICATION LINK USING ONLY 50-VOLT
PEAK-TO-PEAK DRIVE. HALF-WAVE VOLTAGE IS 220 VOLTS
AND CAPACITY IS 53 PF, GIVING A DRIVE-POWER
REQUIREMENT OF 2.6 WATTS PER MHZ OF BANDWIDTH FOR
100 PERCENT MODULATION DEPTH, OR 290 MW FOR 50-
PERCENT MODULATION DEPTH. OPTICAL TRANSMISSION WAS
70 PERCENT ACHIEVED BY USING AN INDEX MATCHING
LIQUID. AN EXTINCTION RATIO OF 30:1 WAS OBTAINED
USING A LASER LIGHT SOURCE. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-682 432 7/3 17/2 9/1
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

DESCRIPTIONS OF INVENTIONS,

(U)

JUN 68 21P BERLIN, A. A. ; MURADYAN, A.
G. ; NESMEYANOV, A. N. ; ANFILOV, E. A. ;
VOLKOV, A. S. ;
REPT. NO. FTD-HT-23-59-68

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. OF A
COLLECTION OF SOVIET PATENTS, BY L. MAROKUS.

DESCRIPTORS: (*PATENTS, USSR), CHELATE COMPOUNDS,
FERROCENES, LIGHT COMMUNICATION SYSTEMS, DATA
TRANSMISSION SYSTEMS, LASERS, ALKYLATION, DIPOLE
ANTENNAS, ANTENNA ARRAYS, ELECTRIC FILTERS,
MAGNETOSTRICTION, DELAY LINES

(U)

CONTENTS: METHOD OF OBTAINING FERROCENE
DERIVATIVES; DEVICE FOR TRANSMISSION AND RECEPTION
OF INFORMATION BY LIGHT CARRIER; METHOD OF
OBTAINING ALKYL DERIVATIVES OF FERROCENE; COPHASIAL
ANTENNA ARRAY WITH ELECTRIC SCANNING; PASSIVE
OPTIMUM FILTER.

(U)

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-682 768 17/2 20/5
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

COMMUNICATIONS APPLICATIONS OF LASERS, (U)

MAR 68 103P KOBZEV, V. V. ; MILINKIS, B.
M. ; EMEL'YANOV, R. G. ;
REPT. NO. FTD-HT-23-1179-67

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UNEDITED ROUGH DRAFT TRANS. OF MONO.
PRIMENENIE OPTICHESKIKH KVANTOVYKH GENERATOROV DLYA
TSELEI SVYAZI, MOSCOW, 1965 P1-120.

DESCRIPTORS: (*LASERS, *LIGHT COMMUNICATION
SYSTEMS), MODULATION, DEMODULATORS,
PHOTOCATHODES, PHOTOMULTIPLIERS, PHOTODIODES,
PHOTOELECTRIC MATERIALS, RADIO COMMUNICATION
SYSTEMS, OPERATION, DESIGN, USSR (U)

IDENTIFIERS: TRANSLATIONS, PHOTODETECTORS, LASER
MODULATORS (U)

CONTENTS: OPERATING PRINCIPLE AND ARRANGEMENT OF
THE LASER; METHODS OF MODULATING LASER EMISSION;
MAIN TYPES OF PHOTODETECTORS; RADIO
COMMUNICATIONS SYSTEMS EMPLOYING LASERS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-684 149 20/6
LIBRARY OF CONGRESS WASHINGTON D C AEROSPACE TECHNOLOGY
DIV

LIGHT PROPAGATION IN A TURBULENT ATMOSPHERE. (U)

DESCRIPTIVE NOTE: SURVEYS OF FOREIGN SCIENTIFIC AND
TECHNICAL LITERATURE,

MAR 69 37P POLUSHKIN, ANDREY ;
REPT. NO. ATD-67-52

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT TRANSMISSION, *ATMOSPHERIC
MOTION), SCIENTIFIC PERSONNEL, SYMPOSIA,
SCINTILLATION, COHERENT RADIATION, LASERS,
OPTICAL IMAGES, USSR (U)

THE REPORT PRESENTS A COMPREHENSIVE OUTLINE OF
SOVIET RESEARCH ON THE PROPAGATION OF LIGHT IN A
TURBULENT ATMOSPHERE. THE MAJORITY OF SOURCE
MATERIALS SCANNED AND PROCESSED FOR THIS STUDY WERE
PUBLISHED DURING THE LAST DECADE. AN ATTEMPT WAS
MADE TO TRACE THE DEVELOPMENT OF THE MAJOR AVENUES OF
RESEARCH ON THIS SUBJECT AS FOLLOWED BY THE PRINCIPAL
SOVIET INVESTIGATORS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-688 411 17/2 20/6
RAND CORP SANTA MONICA CALIF

APERTURE AVERAGING OF OPTICAL SCINTILLATION, (U)

APR 69 23P YURA, H. T.; LUTOMIRSKI, R.
F. ;
REPT. NO. RM-5902--ARPA
CONTRACT: DAHC15-67-C-0141, ARPA ORDER-189-1

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS, OPTICAL
EQUIPMENT COMPONENTS), (*LIGHT TRANSMISSION,
ATMOSPHERIC MOTION), TURBULENCE, SCINTILLATION,
PROPAGATION, LASERS,
APPROXIMATION(MATHEMATICS), ANALYSIS OF
VARIANCE (U)
IDENTIFIERS: APERTURES, SIGNAL PROCESSING (U)

THE APERTURE-AVERAGING FACTOR OF A CIRCULAR
APERTURE IS DERIVED. THIS FACTOR GIVES THE EFFECT
OF A FINITE RECEIVING APERTURE ON SPHERICAL AND PLANE
WAVES IN REDUCING THE VARIANCE OF A FLUCTUATING LIGHT
SIGNAL. CURVES OF THE REDUCTION FACTOR AND
NORMALIZED SIGNAL STANDARD DEVIATION AS A FUNCTION OF
RANGE AND RECEIVER APERTURE DIAMETER ARE PRESENTED
AND ARE COMPARED WITH THOSE WHICH WERE PREVIOUSLY
CALCULATED. IT IS SHOWN THAT FRIED'S RESULTS
AGREE WITH THE RESULTS OBTAINED HERE ONLY FOR
PROPAGATION DISTANCE WHERE THE AVERAGE FIELD IS DOWN
BY A FACTOR OF THE ORDER E TO THE -1 POWER. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-691 846 20/6 20/5
TRW SYSTEMS REDONDO BEACH CALIF QUANTUM PHYSICS LAB

HIGH INTENSITY LASER PROPAGATION IN THE
ATMOSPHERE.

(U)

DESCRIPTIVE NOTE: FINAL REPT.,

JUN 69 91P FRANTZ, L. M. HOLSTEIN, T.

D. ;

REPT. NO. 05691-6014-R0-00

CONTRACT: N00014-66-C-0022, ARPA ORDER-306

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, *LIGHT TRANSMISSION),
(*COHERENT RADIATION, IONOSPHERIC PROPAGATION),
ATMOSPHERE, ABSORPTION, HEATING, FOCUSING,
BAND SPECTRUM, CARBON DIOXIDE, INTENSITY,
NONLINEAR SYSTEMS

(U)

THE RESEARCH REPORTED HERE INVOLVES THE THERMAL SELF-DEFOCUSING EFFECT, WHICH OCCURS IN THE CASE OF HIGH ENERGY LASER BEAM PROPAGATION IN THE ATMOSPHERE. TWO SUBJECTS ARE INVESTIGATED, NAMELY, HEATING MECHANISMS, AND THE DYNAMICS OF THE PROPAGATING LASER BEAM. THE HEATING MECHANISM STUDY IS CONCERNED SPECIFICALLY WITH PHOTO-ABSORPTION IN THE FAR WINGS OF PRESSURE BROADENED CO₂ VIBRATION-ROTATION BANDS, WHILE THE BEAM DYNAMICS ANALYSIS TREATS THE EFFECTS OF TARGET MOTION ON THE DEGREE OF SELF-DEFOCUSING OF THE LASER BEAM. A THEORY OF FAR-WING PRESSURE BROADENING IS DEVELOPED IN WHICH THE BASIC BROADENING MECHANISM IS ASSUMED TO ARISE FROM PERTURBATIONS OF THE ABSORBER'S ROTATIONAL MOTION VIA A SHORT RANGE REPULSIVE INTERACTION WITH A COLLIDING MOLECULE. THE THEORY PREDICTS A FAR-WING SPECTRAL BEHAVIOR DESCRIBED BY A PRODUCT OF A LORENTZ LINE SHAPE AND AN EXPONENTIALLY DECREASING FACTOR, IN GENERAL AGREEMENT WITH RECENT MEASUREMENTS. IN THE BEAM DYNAMICS WORK A CONVENIENT CLOSED FORM EXPRESSION HAS BEEN OBTAINED FOR THE MAXIMUM FLUX WHICH THE THERMAL SELF-DEFOCUSING EFFECT PERMITS ONE TO TRANSMIT THROUGH THE ATMOSPHERE. THIS ANALYSIS TAKES INTO ACCOUNT THE EFFECT OF TARGET MOTION. THE EXPRESSION FOR THE MAXIMUM FLUX DEPENDS UPON SUCH PARAMETERS AS THE INITIAL BEAM INTENSITY, THE INITIAL BEAM DIAMETER, THE TARGET DISTANCE, THE ROTATIONAL RATE OF THE BEAM, AND THE EFFECTIVE ABSORPTION COEFFICIENT FOR HEATING OF AIR BY LIGHT AT THE LASER FREQUENCY. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-692 438 20/6

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

INTERFEROMETRIC PHASE AND AMPLITUDE FLUCTUATION
MEASUREMENTS OVER A 7KM ATMOSPHERIC PATH.

(U)

DESCRIPTIVE NOTE: TECHNICAL NOTE,

MAY 69 35P GEHRELS, ERNST ;

REPT. NO. TN-1969-28

CONTRACT: AF 19(628)-5167, ARPA ORDER-512

MONITOR: LSO TR-69-111

UNCLASSIFIED REPORT

DESCRIPTORS: (*ATMOSPHERIC MOTION, LIGHT
TRANSMISSION), (*COHERENT RADIATION, PHASE
SHIFT), INTERFEROMETERS, LASERS, FREQUENCY
MODULATION, CORRELATION TECHNIQUES, DISTRIBUTION
FUNCTIONS, INTENSITY

(U)

A 6328 A LASER INTERFEROMETER OF THE MICHELSON
TYPE HAS A ONE-WAY PATH LENGTH OF 7 KM. THE
FRINGES ARE RESOLVED BY FREQUENCY-MODULATING THE
LASER SUFFICIENTLY TO SWEEP OVER AT LEAST ONE FRINGE
WIDTH. BY CORRELATION TECHNIQUES, THE RESULTING
FRINGE INTENSITY PATTERN IS RESOLVED INTO THE TRUE
FRINGE CROSSING DIRECTION AND RATE AND INTO LIGHT
AMPLITUDE FLUCTUATIONS. AN UPPER LIMIT OF 300 PER
SECOND IS ESTABLISHED FOR THE FORMER, THE AMPLITUDE
FLUCTUATIONS BEING AT A SLOWER RATE. WITH A
MEASURED INTENSITY RANGE OF UP TO 5000:1, IT IS
CLEAR FROM THE DATA THAT NONE OF THE CURRENTLY
POSTULATED RAYLEIGH, LOG NORMAL, OR RICE
DISTRIBUTIONS MATCH THE AMPLITUDE STATISTICS OVER
THIS FULL RANGE. A LIMITING VALUE OF STANDARD
DEVIATION FOR THE LOG OF THE AMPLITUDE IS 0.85.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-693 230 17/2 9/5
ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER WASHINGTON D
C

ANTENNAS FOR THE OPTICAL WAVE BAND: (U)

AUG 69 18P TYZHN OV, YU. V. ; FRIDMAN, G.
KH. ;
REPT. NO. FSTC-HT-23-309-69
PROJ: FSTC-02TR1002301

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: TRANS. OF MONO. SOVREMENNYE
PROBLEMY ANTENNO-VOLNOVODNOI TEKHNIKI (PRESENT
DAY PROBLEMS OF ANTENNA WAVEGUIDE TECHNIQUES),
N.P., 1967 P189-201.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
LASERS), (*LASERS, *ANTENNAS), FIELD THEORY,
ELECTROMAGNETIC FIELDS, ANTENNA RADIATION PATTERNS,
LIGHT HOMING, LIGHT TRANSMISSION, USSR (U)
IDENTIFIERS: TRANSLATIONS, OPTICAL ANTENNAS (U)

THIS ARTICLE DESCRIBES ANTENNAS FOR OPTICAL BAND
USE WITH LASERS FOR COMMUNICATION AND LOCATION
PURPOSES. THE USE OF VERY SHORT WAVES MAKES IT
POSSIBLE TO EMPLOY EXTREMELY NARROW BEAM ANTENNAS.
OPTICAL SYSTEMS FOR USE WITH TRANSMITTING AND
RECEIVING ANTENNAS ARE DESCRIBED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-693 623 17/2 20/5
HAWAII UNIV HONOLULU DEPT OF ELECTRICAL ENGINEERING

LASER COMMUNICATIONS FOR THE ALOHA SYSTEM. (U)

DESCRIPTIVE NOTE: PRELIMINARY REPT.,
MAY 69 21P KANEHIRA, EARL ;
REPT. NO. THEMIS-869-1
CONTRACT: F44620-69-C-0030
PROJ: AF-9749
TASK: 974901
MONITOR: AFOSR 69-2028TR

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: REPORT ON THE ALOHA SYSTEM.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
*LASERS), DATA TRANSMISSION SYSTEMS,
DIODES(SEMICONDUCTOR), INTERFACES, DIGITAL
SYSTEMS, PULSE CODE MODULATION, GALLIUM
ARSENIDES (U)
IDENTIFIERS: *ALOHA COMMUNICATION SYSTEM (U)

IN THE LASER COMMUNICATION SYSTEM DESIGNED FOR DATA
TRANSMISSION AND RECEPTION, THE INFORMATION CARRYING
BINARY PULSE TRAIN IS USED TO ACTIVATE (FORWARD
BIAS) AND DEACTIVATE (REVERSE BIAS) A LIGHT
EMITTING DIODE. WHEN ACTIVATED, THE LIGHT EMITTING
DIODE EMITS NEAR-INFRARED LIGHT, AND WHEN
DEACTIVATED, NOTHING IS EMITTED. THE RECEIVER THEN
DETECTS THE PRESENCE OR ABSENCE OF THE NEAR INFRARED
RADIATION, USING A LIGHT SENSING DIODE. IN THE
PRESENCE OF LIGHT, THE LIGHT SENSING DIODE PRODUCES A
LARGE PHOTOCURRENT, AND IN THE ABSENCE OF LIGHT, IT
PRODUCES A SMALL CURRENT. ANY DATA TERMINAL THAT
CAN PRODUCE AND ACCEPT BINARY INFORMATION CAN BE USED
DIRECTLY IN A LASER COMMUNICATIONS SYSTEM WITHOUT ANY
INTERFACE PROBLEMS BETWEEN THE TERMINAL AND THE
TRANSMITTER OR RECEIVER. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-693 905 17/5

MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

HOMODYNE DETECTION OF INFRARED RADIATION FROM A
MOVING DIFFUSE TARGET.

(U)

DESCRIPTIVE NOTE: JOURNAL ARTICLE:

MAR 69 9P TEICH, MALVIN CARL ;

REPT. NO. JA-3427

CONTRACT: AF 19(628)-5167, NSF-GK-3620

MONITOR: ESD TR-69-232

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN PROCEEDINGS OF THE IEEE, V57
N5 P786-792 MAY 69.

SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 20 JAN
69.

DESCRIPTORS: (*INFRARED RADIATION, DETECTION),
GAS LASERS, CARBON DIOXIDE, COHERENT RADIATION,
SCATTERING, POWER SPECTRA, PROBABILITY DENSITY
FUNCTIONS, TARGETS, OPDAR, INFRARED DETECTORS
IDENTIFIERS: CARBON DIOXIDE LASERS

(U)

(U)

EXPERIMENTS HAVE BEEN PERFORMED IN WHICH THE
RADIATION FROM A CO₂ LASER WAS COHERENTLY DETECTED
AFTER BEING SCATTERED FROM A MOVING DIFFUSE
REFLECTOR. THIS IS GENERALLY THE CONFIGURATION OF
AN INFRARED LASER RADAR. THE POWER-SPECTRAL-
DENSITY OF THE HETERODYNE SIGNAL WAS MEASURED AND ITS
WIDTH WAS SHOWN TO AGREE WITH THE CALCULATED VALUE
BASED ON A THEORETICAL MODEL FOR THE PROCESS.
EXPRESSIONS ARE OBTAINED FOR THE RATIO OF
HETERODYNE SIGNAL BANDWIDTH TO HETERODYNE FREQUENCY
FOR THE CASES OF FOCUSED RADIATION, UNFOCUSED
RADIATION, AND FOR A TYPICAL RADAR CONFIGURATION.
IN MOST CASES, THE HETERODYNE SIGNAL IS FOUND TO
POSSESS A NARROW-BAND CHARACTER. THE PROBABILITY
DENSITY OF THE SIGNAL ENVELOPE WAS ALSO MEASURED FOR
A KNOWN SCATTERER (PROVIDING GAUSSIAN SCATTERED
RADIATION) AND WAS FOUND TO BE RAYLEIGH
DISTRIBUTED, AS EXPECTED. THE POWER-SPECTRAL-
DENSITY AND ENVELOPE PROBABILITY DISTRIBUTION PROVIDE
INFORMATION ABOUT A SCATTERING MEDIUM OR TARGET WHICH
CANNOT BE OBTAINED FROM AVERAGE-VALUE MEASUREMENTS OF
THE HETERODYNE SIGNAL-TO-NOISE RATIO. THIS
INFORMATION IS USEFUL FOR COMMUNICATIONS
APPLICATIONS, INFRARED RADAR, AND HETERODYNE
SPECTROSCOPY EXPERIMENTS. FINALLY, A SIMPLE AND
DIRECT METHOD OF OBTAINING INFORMATION ABOUT THE
STATISTICS OF AN INCIDENT RADIATION FIELD (WHICH
DOES NOT INVOLVE PHOTOCOUNTING) IS DISCUSSED.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-693 939 17/2 20/5
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

ROGER EARTH, OVER.... (U)

MAR 69 7P POKROVSKII, G. ;
REPT. NO. FTD-HT-23-1237-68

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF TEKHNIKA-
MOLODEZHI (USSR) V35 N11 P37-38 1967, BY L.
THOMPSON.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
FEASIBILITY STUDIES), LASERS, RUBY, GAS
IONIZATION, CONVEYORS, PIPES, ENERGY, MATERIALS,
USSR (U)
IDENTIFIERS: INTERPLANETARY PIPELINES,
TRANSLATIONS (U)

THE AUTHOR ASSERTS THAT EVENTUALLY SCIENTISTS WITH
THE AID OF A LASER WILL BE SUCCESSFUL IN THEIR
ATTEMPTS TO TRANSMIT ENERGY IN THE FORM OF A LIGHT
BEAM FROM THE EARTH TO THE MOON. HE STATES THAT
BESIDES ENERGY AND INFORMATION, THIS SAME CONVEYER
COULD BE USED TO TRANSMIT OTHER MATTER, SUCH AS FUEL,
AIR, AND METALS, THEREBY PARTIALLY SOLVING ONE OF THE
MAJOR PROBLEMS OF DELIVERING ESSENTIAL GOODS TO THE
MOON AND POSSIBLY TO OTHER PLANETS AT A MINIMUM COST.
HE SUGGESTS A HOLLOW LASER BEAM, WHICH COULD BE
ACHIEVED WITH THE USE OF LIGHT CONDUCTORS OR A HOLLOW
RUBY ROD. SUCH PIPELINES COULD REACH THROUGH SPACE
FROM ONE PLANET TO ANOTHER CARRYING INFORMATION,
ENERGY, AND MATTER. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-695 279 9/4 17/2
PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF ELECTRICAL
ENGINEERING

INFORMATION RATES FOR PHOTOCOUNT DETECTION SYSTEMS,

(U)

JAN 69 7P FILLMORE, GARY L. FLACHS,
GERARD ;
CONTRACT: DA-31-124-AROD-383
PROJ: DA-20-061102-B-13-E
MONITOR: AROD 5659:8-E

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN IEEE TRANSACTIONS ON
INFORMATION THEORY VIT-15 N4 P465-468 JUL 69.
SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 11 OCT
68.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
*INFORMATION THEORY), (*COHERENT RADIATION,
DETECTION), (*PHOTOELECTRONS, COUNTING
METHODS), MATHEMATICAL MODELS, LASERS

(U)

IDENTIFIERS: OPTICAL COMMUNICATION,
TELECOMMUNICATION, RANDOM NOISE

(U)

A MODEL THAT ALLOWS ONE TO CALCULATE INFORMATION
RATES FOR OPTICAL COMMUNICATION SYSTEMS THAT USE
PHOTOCOUNT DETECTION IS PRESENTED. THIS MODEL HAS
ITS BASIS IN THE COHERENT STATES OF THE FIELD. IT
CONSISTS OF A SOURCE THAT PLACES THE FIELD IN A
COHERENT STATE, A CHANNEL THAT CAN INTRODUCE ADDITIVE
GAUSSIAN NOISE, AND A PHOTODETECTOR THAT PRODUCES THE
NUMBER OF PHOTOCOUNTS IN THE DETECTION INTERVAL AS
OUTPUT SYMBOLS. THE CAPABILITY OF INTRODUCING
ADDITIVE GAUSSIAN NOISE CAN ALSO BE USED TO
REPRESENT A PHYSICAL SOURCE. THE MODEL IS APPLIED
TO SEVERAL EXAMPLES TO ILLUSTRATE ITS USE. THE
RATE OF FLOW OF INFORMATION THROUGH THE CHANNEL IS
CALCULATED FOR A BINARY CHANNEL WITH AND WITHOUT
ADDITIVE GAUSSIAN NOISE. THE INFORMATION RATE
FOR A NOISELESS CHANNEL IS ALSO OBTAINED FOR THE CASE
IN WHICH THE SIGNALS SENT BY A SINGLE-MODE COHERENT
SOURCE ARE SELECTED FROM A GAUSSIAN DISTRIBUTION.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-695 945 20/5 17/2
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

CERTAIN CHARACTERISTICS OF A GA AS OPTICAL
QUANTUM AMPLIFIER,

(U)

JUL 69 12P MOMA, YU. A. ; ABRAMOV, V.
S. ; KOBZEV, V. V. ;
REPT. NO. FTD-MT-24-127-69

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF MONO.
POLUPROVODNIKOVYE PRIBORY V TEKHNIKE ELEKTROSVYAZI.
SBORNIK STATEI (SEMICONDUCTOR INSTRUMENTS IN THE
TECHNOLOGY OF TELECOMMUNICATION. COLLECTION OF
ARTICLES), N.P., 1968 P141-145.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
FEASIBILITY STUDIES), (*SEMICONDUCTOR DEVICES,
*LASERS), GALLIUM ARSENIDES, LIGHT PULSES,
CRYOGENICS, USSR

(U)

IDENTIFIERS: GALLIUM ARSENIDE LASERS,
TRANSLATIONS

(U)

THE ARTICLE GIVES RESULTS OF THE MEASUREMENT OF
AMPLIFICATION FACTORS OF A SEMICONDUCTOR OPTICAL
QUANTUM AMPLIFIER OKU BASED ON GALLIUM ARSENIDE, IN
PULSE CONDITIONS AT THE TEMPERATURE OF LIQUID
NITROGEN. CONCLUSIONS ARE DRAWN AS TO THE
PROSPECTS OF THE APPLICATION OF OKU IN OPTICAL
COMMUNICATION LINES. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-699 665

20/5

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

SOME CHARACTERISTICS OF A HELIUM-NEON LASER WITH A
KDP CRYSTAL INSIDE THE RESONATOR,

(U)

OCT 69 12P KRIVOSHCHIEV, G. V. ;

TELEGIN, G. G. ; FOLIN, K. G. ;

REPT. NO. FTD-HT-23-404-69

PROJ: FTD-7230178

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED TRANS. OF AKADEMIYA NAUK
SSSR. SIBIRSKOE OTDELENIE. IZVESTIYA, SERIYA
KHIMICHESKIKH NAUK, N1 P127-131 1968, BY H.
PECK.

DESCRIPTORS: (*GAS LASERS, *MODULATION),
MODULATORS, ELECTROOPTICS, POTASSIUM COMPOUNDS,
PHOSPHATES, ELECTRIC FIELDS, USSR

(U)

IDENTIFIERS: HELIUM NEON LASERS, POTASSIUM
DIHYDROGEN PHOSPHATE, POTASSIUM PHOSPHATES,
TRANSLATIONS, *LASER MODULATORS

(U)

THE DEPENDENCE OF RADIATION INTENSITY OF A HE-
NE LASER ON ORIENTATION OF AN ELECTROOPTICAL
CRYSTAL AND ON CONTROLLING ELECTRIC FIELD STRENGTH
WAS STUDIED TO OPTIMIZE OPERATING CONDITIONS OF THE
LASER WITH INTERNAL MODULATION. THE ELECTROOPTICAL
CRYSTAL WAS PLACED INSIDE A 2-MIRROR RESONATOR SO
THAT THE NORMAL OF THE CRYSTAL SURFACE MADE THE
BREWSTER ANGLE WITH THE DIRECTION OF INCIDENT BEAM
AND SO THAT THE DIRECTION OF THE BEAM INSIDE THE
CRYSTAL AGREED WITH THE DIRECTION OF THE OPTICAL
AXIS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-700 049 20/6 20/5
AIR FORCE CAMBRIDGE RESEARCH LABS L G HANSCOM FIELD
MASS

TRANSVERSE MODE ELECTRO-OPTIC MATERIALS. (U)

DESCRIPTIVE NOTE: PHYSICAL SCIENCES RESEARCH PAPERS,
JAN 70 21P ARMINGTON, A. F. JOHANNON,
J. J. ;

REPT. NO. AFCRL-PSRP-402, AFCRL-70-0005

PROJ: AF-5620

TASK: 562009

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PRESENTED AT THE AVIONICS PANEL,
TECHNICAL SYMPOSIUM (17TH) TONSBERG (NORWAY) 29
SEP 69.

DESCRIPTORS: (*OPTICAL MATERIALS, *ELECTROOPTICS),
(*COPPER COMPOUNDS, CRYSTAL GROWTH),
(*MODULATORS, LASERS), CHLORIDES, GELS,
LASERS, MODULATION, LIGHT TRANSMISSION (U)
IDENTIFIERS: COPPER CHLORIDES, *LASER
MODULATORS (U)

MOST ELECTRO-OPTIC MODULATORS PRESENTLY USED ARE
CRYSTALS SUCH AS KDP WHICH EXHIBIT A LONGITUDINAL
ELECTRO-OPTIC EFFECT. IT HAS BEEN DEMONSTRATED
THAT A MORE EFFICIENT MODULATOR CAN BE PRODUCED WHEN
A CRYSTAL HAVING A TRANSVERSE ELECTRO-OPTIC EFFECT IS
EMPLOYED. GENERALLY THESE CRYSTALS ARE PRODUCED
EITHER FROM THE MELT OR FROM FLUXES. SINCE MELT
GROWN CRYSTALS MUST BE COOLED THROUGH SEVERAL HUNDRED
DEGREES AND OFTEN MUST UNDERGO PHASE TRANSITIONS,
THESE CRYSTALS ARE GENERALLY HIGHLY STRAINED. FLUX
GROWN CRYSTALS ARE ALSO UNSATISFACTORY BECAUSE OF THE
TENDENCY TO INCORPORATE THE FLUX INTO THE LATTICE.
IN THIS PAPER A METHOD OF PRODUCING CRYSTALS WITH A
TRANSVERSE ELECTRO-OPTIC EFFECT AT ROOM TEMPERATURE
IS PRESENTED WHICH RESULTS IN STRAIN-FREE CRYSTALS OF
HIGH PURITY. THE PRINCIPAL MATERIAL DISCUSSED IS
CUPROUS CHLORIDE WHICH HAS THE ADDED ADVANTAGE THAT
IT HAS TRANSPARENCY IN THE INFRARED RANGE OUT TO AT
LEAST TWENTY MICRONS. THE SYSTEM USED FOR THE
EVALUATION OF MATERIALS IS DISCUSSED AS WELL AS
RESULTS FOR CUPROUS CHLORIDE AND OTHER MATERIALS
PRODUCED BY ROOM TEMPERATURE TECHNIQUES. THIS WORK
HAS PROVIDED A SIGNIFICANTLY IMPROVED LASER MODULATOR
MATERIAL OF POTENTIAL VALUE FOR COMMUNICATION SYSTEMS
AND SIMILAR APPLICATIONS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-702 408 17/2
NAVAL ORDNANCE LAB WHITE OAK MD

THE INTERACTION OF CO2 LASER RADIATION AND
WATER.

(U)

DESCRIPTIVE NOTE: FINAL REPT. JUN 68-JUN 69.
JAN 70 22P LONEY, JEREMIAH R. ;
SULLIVAN, JOHN B. ;
REPT. NO. NOLTR-69-166
PROJ: A37-533/000/WF08-123-702

UNCLASSIFIED REPORT

DESCRIPTORS: (*GAS LASERS, *UNDERWATER SOUND),
(*UNDERWATER COMMUNICATION SYSTEMS, GAS LASERS),
AIR-TO-UNDERWATER, LIGHT COMMUNICATION SYSTEMS,
INTERACTIONS
IDENTIFIERS: CARBON DIOXIDE LASERS

(U)

(U)

THE OUTPUT OF A CO2 LASER WAS FOCUSED UPON THE
SURFACE OF WATER TO STUDY THE GENERATION OF SONIC
WAVES FOR AIR TO WATER COMMUNICATION. A ROTATING
MIRROR Q-SWITCH SYSTEM AND AN ELECTRICAL PULSING
SYSTEM WERE USED TO OBTAIN LASER PULSES.
CONTINUOUS WAVE OUTPUT WAS ALSO INVESTIGATED. IN
EACH CASE, THERE WERE THREE OBVIOUS EFFECTS FROM THE
INTERACTION (1) GENERATION OF AN ACOUSTIC WAVE IN
AIR; (2) GENERATION OF AN ACOUSTIC WAVE IN WATER;
AND (3) GENERATION OF A CIRCULAR SURFACE WAVE.
THE BEST EFFICIENCY FOR PRODUCING A WATER ACOUSTIC
DISTURBANCE WAS ABOUT 10 TO THE -6TH POWER. ONE
PART IN 10,000 OF THE ACOUSTIC ENERGY COUPLED INTO
THE WATER - THE BALANCE IS DISSIPATED IN THE AIR.
PLACING A TRANSPARENT WINDOW ON THE SURFACE
ENHANCED THE WATER ACOUSTIC WAVE SO THAT IT WAS
COMPARABLE IN ENERGY TO THE AIR ACOUSTIC WAVE. IT
IS CONCLUDED THAT THE PROCESS IS VERY LOSSY, ALTHOUGH
FURTHER IMPROVEMENTS IN LASER ENGINEERING MAY YIELD
BETTER RESULTS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-702 944 17/2

FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

MOTION PICTURE AND TELEVISION ENGINEERING. VOLUME
13, NUMBER 5, 1969 (SELECTED ARTICLES), (U)

DEC 69 32P ARKADEV, D. I. ;MILINKIS, B.
M. ;SOKOLOV, P. L. ;KRUSSE, B. V. ;
REPT. NO. FTD-MT-24-350-69
PROJ: FTD-4160301

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF TEKHNIKA
KINO I TELEVIDENIYA (USSR) V13 N5 P52-62 1969, BY
JOHN W. ANDERSON, JR.

DESCRIPTORS: (*TELEVISION DISPLAY SYSTEMS,
*LASERS), (*IMAGE ORTHICONS, TELEVISION
EQUIPMENT), OPTICAL IMAGES, DISTORTION,
MODULATION, USSR (U)

IDENTIFIERS: TRANSLATIONS, TELEVISION
BROADCASTING (U)

CONTENTS: USE OF LASERS IN TELEVISION; LIGHT
AND POTENTIAL CHARACTERISTICS OF IMAGE
ORTHICONS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-706 292 17/2 9/4
MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF
ELECTRONICS

EFFICIENT OPTICAL COMMUNICATION IN A TURBULENT
ATMOSPHERE.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
APR 70 125P HALME, SEPPO J. ;
REPT. NO. TR-474
CONTRACT: DA-28-043-AMC-02536(E), NGL-22-009-013
PROJ: DA-2-0-061102-B-31-F

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: DOCTORAL THESIS.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
ATMOSPHERIC MOTION), LIGHT TRANSMISSION,
DETECTION, OPTIMIZATION, NOISE(RADIO),
INFORMATION THEORY, LASERS, STATISTICAL
DISTRIBUTIONS, PROBABILITY DENSITY FUNCTIONS,
THESES

(U)

GIVEN A TRANSMITTER THAT RADIATES AN
ELECTROMAGNETIC LIGHT FIELD, IT IS ASSUMED THAT THE
RESULTING FIELD AT THE PLANE OF THE RECEIVER APERTURE
IS LOG-NORMAL WITH SOME COHERENCE PROPERTIES.
VARIOUS REPRESENTATIONS OF THE FIELD ARE
DISCUSSED: APERTURE SAMPLING, PLANE-WAVE
DECOMPOSITION, AND KARHUNEN-LOEVE EXPANSION.
THE STATISTICAL PROPERTIES OF THE COEFFICIENTS IN
THESE REPRESENTATIONS ARE INVESTIGATED BY ANALYTICAL,
SIMULATION, AND EXPERIMENTAL METHODS. BASED ON
THESE REPRESENTATIONS THE PROBLEM OF OPTIMUM
DETECTION OF AN ORTHOGONAL SIGNAL SET, SUBJECT TO
DISTORTION AND NOISE IN THE ATMOSPHERE, IS
INVESTIGATED. THE OPTIMUM RECEIVER AND ITS
PERFORMANCE ARE EVALUATED AND DISCUSSED IN THE CASES
OF LOG-NORMAL AND GAUSSIAN STATISTICS, CLASSICAL
AND QUANTUM MODELS, LARGE AND SMALL APERTURES, AND
STRONG, WEAK OR ABSENT BACKGROUND NOISE.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-707 629 20/5
CALIFORNIA UNIV BERKELEY DEPT OF ELECTRICAL
ENGINEERING

SWITCHING OF PHASE-LOCKED STATES IN THE
INTRACAVITY PHASE-MODULATED HE-NE LASER, (U)

FEB 69 12P HONG, G. W. ; WHINNERY, J.

R. ;

CONTRACT: AF-AFOSR-1488-68

PROJ: AF-4751

MONITOR: AFOSR 70-1677TR

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN IEEE JNL. OF QUANTUM
ELECTRONICS, VQE-5 N7 P367-376 JUL 69.

DESCRIPTORS: (*GAS LASERS, PHASE-LOCKED SYSTEMS),
PHASE MODULATION, HELIUM, NEON, ISOTOPES,
FREQUENCY MODULATION (U)
IDENTIFIERS: *HELIUM NEON LASERS, SWITCHING (U)

IT IS KNOWN THAT THERE EXIST TWO SOLUTIONS FOR THE
HE-NE LASER PHASE LOCKED BY SYNCHRONOUS INTERNAL
PHASE MODULATION. ONE CORRESPONDS TO A PHASE
DIFFERENCE BETWEEN ADJACENT MODES OF EVEN INTEGERS OF
PI (EVEN STATE) AND THE OTHER TO ODD INTEGERS OF
PI (ODD STATE). ALTHOUGH THEIR FREQUENCY POWER
SPECTRA IN GENERAL LOOK SIMILAR, THEY APPEAR IN THE
TIME RESPONSE AS TWO DIFFERENT SETS OF PULSE TRAINS
180 DEG OUT OF PHASE WITH RESPECT TO EACH OTHER.
OF THE TWO, FOR A GIVEN SET OF CONDITIONS, IT HAS
NOT YET BEEN POSSIBLE TO PREDICT WHICH STATE WILL
OSCILLATE. IT WAS FOUND THAT, IF THE MODULATION
FREQUENCY IS FIXED SLIGHTLY HIGHER THAN THE AVERAGE
AXIAL-MODE SPACING NEAR THE LINE CENTER, THE TWO
STATES CAN BE CONTROLLED BY VARYING THE AMPLITUDE OF
THE MODULATION SIGNAL, RESULTING IN A SWITCHING
ACTION BETWEEN THE TWO STATES. FURTHERMORE, IT WAS
FOUND THAT IN A NARROW REGION OF 'DETUNING' AND IN A
SMALL RANGE OF MODULATION AMPLITUDES, BOTH STATES
OSCILLATE SIMULTANEOUSLY. THE ABOVE RESULTS WERE
ANALYZED BY CONSIDERING THE ASSYMMETRY IN THE
FREQUENCY CHARACTERISTICS OF THE GAIN MEDIUM DUE TO
THE PRESENCE OF THE ISOTOPE NE22 IN THE HE-NE
MIXTURE. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-707 861 20/6
RAND CORP SANTA MONICA CALIF

PROPAGATION OF A FINITE OPTICAL BEAM IN AN
INHOMOGENEOUS MEDIUM,

(U)

APR 70 41P LUTOMIRSKI, R. F. ;
REPT. NO. RM-6055-ARPA
CONTRACT: DAHC15-67-C-0141, ARPA ORDER-189-1

UNCLASSIFIED REPORT

DESCRIPTORS: (*ATMOSPHERIC MOTION, LIGHT
TRANSMISSION), (*COHERENT RADIATION,
DIFFRACTION), LIGHT COMMUNICATION SYSTEMS, RANGE
FINDING, TARGET ACQUISITION, REFRACTIVE INDEX, GAS
LASERS, IRASERS

(U)

THE MEMORANDUM IS PART OF A STUDY OF THE EFFECT
OF ATMOSPHERIC TURBULENCE ON OPTICAL AND INFRARED
RECONNAISSANCE AND GUIDANCE EQUIPMENT. A
QUANTITATIVE UNDERSTANDING OF THE MANNER IN WHICH AN
INITIALLY COHERENT BEAM OF FINITE CROSS SECTION
PROPAGATES IS REQUIRED FOR THE PREDICTION OF THE
PERFORMANCE OF VARIOUS DEVICES EMPLOYING LASERS FOR
TARGET ACQUISITION OR GUIDANCE IN TACTICAL MISSIONS,
OPTICAL COMMUNICATION SYSTEMS, AND OTHER DEVICES.
THE MEMORANDUM CALCULATES THE MEAN INTENSITY
DISTRIBUTION FOR AN ARBITRARY AMPLITUDE AND PHASE
DISTRIBUTION IN A FINITE APERTURE IN BOTH THE NEAR
AND FAR FIELD AND EXAMINES IN DETAIL THE CASE OF A
UNIFORM DISTRIBUTION ACROSS A CIRCULAR APERTURE.
THE RESULTS SHOULD BE OF USE TO THOSE INTERESTED IN
PROPAGATION THEORY AND ITS APPLICATIONS TO LASER
RANGE FINDERS, LASER LINE SCANNERS, COMMUNICATION
SYSTEMS, AND VARIOUS GUIDANCE AND OTHER SYSTEMS
EMPLOYING AN ILLUMINATING BEAM. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-707 948 17/2 20/6 17/5 17/8
MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF
ELECTRONICS

EFFICIENT ANALOG COMMUNICATION OVER QUANTUM
CHANNELS.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,

JAN 70 112P PERSONICK, STEWART D. ;
REPT. NO. TR-477

CONTRACT: DA-28-043-AMC-02536(E), NGL-22-009-013

PROJ: DA-2-0-061102-B-31-F

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
FEASIBILITY STUDIES), (*COHERENT RADIATION,
LIGHT TRANSMISSION), (*PHOTONS, COUNTING
METHODS), INFORMATION THEORY, QUANTUM MECHANICS,
ANALOG SYSTEMS, THESES

(U)

IDENTIFIERS: STATISTICAL DECISION THEORY

(U)

THE REPORT IS CONCERNED WITH THE INCORPORATION OF
THE AXIOMS OF QUANTUM MEASUREMENTS INTO CURRENT
COMMUNICATION ESTIMATION THEORY. IT IS WELL KNOWN
THAT CLASSICAL ELECTROMAGNETIC THEORY DOES NOT
ADEQUATELY DESCRIBE FIELDS AT OPTICAL FREQUENCIES.
THE ADVENT OF THE LASER HAS MADE THE USE OF OPTICAL
CARRIERS FOR INFORMATION TRANSMISSION PRACTICAL.
CLASSICAL COMMUNICATION ESTIMATION THEORY
EMPHASIZES BACKGROUND NOISE AND CHANNEL FADING AS
PRIMARY LIMITATIONS ON SYSTEM PERFORMANCE. AT
OPTICAL FREQUENCIES, QUANTUM EFFECTS MAY TOTALLY
DOMINATE PERFORMANCE. ESTIMATION THEORY IS
FORMULATED USING THE QUANTUM THEORY SO THAT THIS TYPE
OF SYSTEM LIMITATION CAN BE UNDERSTOOD, AND OPTIMAL
RECEIVERS AND SYSTEMS DESIGNED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-708 677 17/2 9/5
SIGNALS RESEARCH AND DEVELOPMENT ESTABLISHMENT
CHRISTCHURCH (ENGLAND)

A 1 KM RANGE OPTICAL LINK FOR VIDEO SIGNALS
INCORPORATING A SIMPLE AGC AND TEMPERATURE
COMPENSATION CIRCUIT FOR AVALANCHE PHOTODIODES, (U)

APR 70 10P DORE, M. J. ;
REPT. NO. SRDE-70018
MONITOR: TRC BR-19358

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
FEASIBILITY STUDIES), AUTOMATIC GAIN CONTROL,
GALLIUM ARSENIDES, SILICON, INFRARED DETECTORS,
LASERS, PHOTODIODES, GREAT BRITAIN (U)
IDENTIFIERS: GALLIUM ARSENIDE LASERS (U)

GALLIUM ARSENIDE LAMPS AND SILICON AVALANCHE
DETECTORS ARE RELIABLE COMPONENTS FOR OPTICAL
COMMUNICATION. IT HAS BEEN SHOWN THAT DIRECT
ANALOGUE MODULATION IS PROBABLY THE BEST APPROACH TO
A 1KM RANGE OPTICAL COMMUNICATION LINK FOR VIDEO
BANDWIDTHS. THIS MEMORANDUM DESCRIBES BRIEFLY
EXPERIMENTAL TERMINALS FOR SUCH A LINK. LABORATORY
MEASUREMENT INDICATED THAT A CLEAR WEATHER 'IN HAND'
FACTOR OF 13DB OR MORE ABOVE THE 30DB S/N
RATIO NEEDED SHOULD BE ACHIEVED RESULTING IN AN
EXPECTED OUTAGE TIME OF LESS THAN 10 DAYS PER YEAR.
A SIMPLE AGC AND TEMPERATURE STABILIZATION
CIRCUIT FOR AVALANCHE DIODES IS DESCRIBED.
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-708 896 20/5
AVCO EVERETT RESEARCH LAB EVERETT MASS

LASER BEAM TRANSMISSION THROUGH THE
ATMOSPHERE.

(U)

DESCRIPTIVE NOTE: RESEARCH REPT.,
MAR 70 46P WALLACE, J. , JR.; CAMAC, M.

REPT. NO. AERL-RR-347
CONTRACT: F29601-69-C-0060
PROJ: AF-3326

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, IONOSPHERIC PROPAGATION),
COHERENT RADIATION, ELECTROMAGNETIC WAVES,
REFRACTIVE INDEX, ABSORPTION, CARBON DIOXIDE,
ATMOSPHERIC REFRACTION

(U)

THEORETICAL EVALUATION OF THE TRANSMISSION OF A
LASER BEAM AT 10.6 MICRONS HAS BEEN INVESTIGATED
USING THE TECHNIQUES OF GEOMETRIC OPTICS. THE
INTERACTION IS NON-LINEAR BECAUSE THE REFRACTIVE
INDEX DEPENDS THROUGH THE MECHANISM OF ABSORPTION,
UPON THE INTENSITY OF THE PROPAGATING WAVE.
ATMOSPHERIC ABSORPTION AT 10.6 MICRONS IS CAUSED BY
CO2 AND H2O IN THE ATMOSPHERE. ASSOCIATED
WITH ABSORPTION BY CO2 AND TRANSVERSE FLOW CAUSED
BY ATMOSPHERIC WINDS OR BEAM MOTION ARE VIBRATIONAL
RELAXATION EFFECTS WHICH CAN EITHER HEAT OR COOL THE
ATMOSPHERE. IF THE ATMOSPHERE IS COOLED, THE BEAM
IS SELF-FOCUSED. THE VELOCITY-ALTITUDE DEPENDENCE
OF HEATING AND COOLING REGIMES ARE DEFINED AND
DETAILED INTENSITY DISTRIBUTIONS IN EACH REGIME ARE
PRESENTED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-709 434 20/5 4/1
INSTITUTE FOR DEFENSE ANALYSES ARLINGTON VA SCIENCE AND
TECHNOLOGY DIV

DESCRIPTION OF ATMOSPHERIC TURBULENCE FOR LINEAR
PROPAGATION OF LASER BEAMS.

(U)

DESCRIPTIVE NOTE: RESEARCH PAPER,
JUL 70 75P HIDALGO, HENRY ; VAGLIO-
LAURIN, ROBERTO ;
REPT. NO. RP-P-600
CONTRACT: DAHC15-67-C-0011
MONITOR: IDA/HQ 70-11343

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, LIGHT TRANSMISSION),
(*LIGHT TRANSMISSION, *ATMOSPHERIC MOTION),
BOUNDARY LAYER, ATMOSPHERIC REFRACTION,
PROPAGATION, SIGNALS, SCATTERING

(U)

THE PAPER CONSIDERS THE FLUID MECHANICAL ASPECTS
AND DATA RELEVANT TO THE PROPAGATION OF LOW POWER-
DENSITY LASERS IN THE ATMOSPHERIC BOUNDARY LAYER.
ITS SCOPE INCLUDES THE FOLLOWING TOPICS: (A)
FORMULATION OF THE ROLE OF THE TURBULENT STRUCTURE IN
DETERMINING PHASE AND AMPLITUDE CHARACTERISTICS OF
RECEIVED SIGNALS, WITH EMPHASIS ON SINGLE SCATTERING
SITUATIONS, (B) REVIEW OF AVAILABLE FLUID
MECHANICAL DATA FOR MEAN AND FLUCTUATING FLOW
PROPERTIES FOR VARIOUS ATMOSPHERIC CONDITIONS,
(C) IDENTIFICATION OF THE ATMOSPHERIC CONDITIONS
THAT REQUIRE COMPLEMENTARY FLUID MECHANICAL
MEASUREMENTS, AND (D) PROBLEM AREAS THAT NEED
FURTHER THEORETICAL INVESTIGATIONS CONCERNING THE
EFFECT OF ATMOSPHERIC TURBULENCE ON OPTICAL WAVE
PROPAGATION. (AUTHOR)

(U)

UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-709 579 20/5 20/6
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

DETERMINATION OF ATMOSPHERICALLY INDUCED PHASE
FLUCTUATIONS BY LONG DISTANCE INTERFEROMETRY AT
6328 A.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
MAY 70 21P BUSER, RUDOLF G. ; BORN,
GUNTARD K. ;
REPT. NO. ECOM-3283
PROJ: DA-1-T-061102-B-31-A
TASK: 1-T-061102-B-31-A-01

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT TRANSMISSION, PHASE
DISTORTION), LIGHT COMMUNICATION SYSTEMS,
INTERFEROMETERS, GAS LASERS, ATMOSPHERIC MOTION
IDENTIFIERS: HELIUM NEON LASERS

(U)

(U)

EXPERIMENTAL VALUES OF ATMOSPHERICALLY INDUCED
PHASE FLUCTUATIONS HAVE BEEN OBTAINED FOR VARIOUS
PATHLENGTHS USING A NEAR-GROUND HORIZONTAL MACH-
ZEHNDER SETUP AT 6328 A. INDEPENDENT
DETERMINATION OF THE STRUCTURE FUNCTION CONSTANT OF
THE REFRACTIVE INDEX AND OTHER RELEVANT PARAMETERS
PERMITTED A CLEAR DEFINITION OF PREVAILING
METEOROLOGICAL CONDITIONS. IT IS FOUND THAT FOR LOW
TURBULENCE, OR STRONG TURBULENCE AND SHORT
PATHLENGTH, TATARSKI'S THEORY GENERALLY UNDER-
ESTIMATES THE VALUES OF THE OBSERVED RMS PHASE
FLUCTUATIONS. FOR HIGHER TURBULENCE NO CONTINUOUS
PHASE INFORMATION IS DIRECTLY OBTAINABLE, AND THE
CONCEPT OF PHASE STRUCTURE FUNCTION BECOMES
EXPERIMENTALLY UNDEFINED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-710 178 20/5 17/2
TECHNION RESEARCH AND DEVELOPMENT FOUNDATION LTD HAIFA
(ISRAEL)

SPECTROSCOPIC STUDIES WITH A TUNABLE N2O LASER,

(U)

SEP 69 5P OPPENHEIM, URI P. ; MELMAN,
PAUL ;
CONTRACT: E00AR-69-0053
PROJ: AF-9750
TASK: 975001
MONITOR: AFOSR 70-2115TR

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN JNL. OF THE OPTICAL
SOCIETY OF AMERICA, V60 N3 P332-334 MAR 70.

DESCRIPTORS: (*GAS LASERS, *NITROGEN OXIDES),
(*LIGHT COMMUNICATION SYSTEMS, GAS LASERS),
INFRARED COMMUNICATION SYSTEMS, ISRAEL
IDENTIFIERS: *NITROGEN OXIDE LASERS, NITROGEN
OXIDE (N2O), *TUNABLE LASERS

(U)

(U)

AN N2O LASER IS DESCRIBED WHICH IS TUNABLE OVER
65 ROTATIONAL LINES OF THE 001-100 BAND. A SIMPLE
METHOD IS USED TO DETERMINE THE CAVITY LOSSES OF THIS
LASER. ABSORPTION OF A NUMBER OF N2O LINES BY
THE 001-100 BAND OF CO2 IS DEMONSTRATED. THE P
(20) LINE OF N2O IS OBSERVED AFTER ATTENUATION
BY A LONG PATH OF N2O AT 125-TORR PRESSURE AND
THE PEAK ABSORPTION COEFFICIENT FOR THIS LINE IS
FOUND TO BE 0.0094/CM AT 300 K. THE N2O LASER
HAS A CERTAIN ADVANTAGE OVER THE CO2 LASER FOR
LONG-RANGE COMMUNICATIONS THROUGH THE ATMOSPHERE.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-710 712 20/6 20/12
CALIFORNIA INST OF TECH PASADENA DIV OF ENGINEERING AND
APPLIED SCIENCE

OPTICAL GUIDING AND ELECTRO-OPTIC MODULATION IN
GAAS EPITAXIAL LAYERS,

(U)

APR 70 3P HALL, DAVID ; YARIV, AMNON ;
GARMIRE, ELSA ;

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN OPTICS COMMUNICATIONS, V1 N9
P403-405 APR 70.

SUPPLEMENTARY NOTE: SPONSORED IN PART BY THE OFFICE OF
NAVAL RESEARCH, WASHINGTON, D. C.

DESCRIPTORS: (*GALLIUM ARSENIDES, *ELECTROOPTICS),
(*INFRARED RADIATION, MODULATION),
SEMICONDUCTING FILMS, EPITAXIAL GROWTH,
WAVEGUIDES, LASERS

(U)

SINGLE MODE TE OR TM PROPAGATION IS
DEMONSTRATED IN AN OPTICAL WAVEGUIDE CONSISTING OF A
HIGH RESISTIVITY SEMICONDUCTOR (GAAS) LAYER
(ABOUT 10 MICROMETERS) WHICH IS SANDWICHED
BETWEEN A METAL FILM AND A LOWER RESISTIVITY
SEMICONDUCTOR. A REVERSE BIAS APPLIED TO THE METAL-
SEMICONDUCTOR SCHOTTKY BARRIER CAUSES AN ELECTRO-
OPTIC RETARDATION (OR, IN GENERAL, PHASE
VARIATION) WHICH CAN BE USED FOR MODULATION
PURPOSES. AMPLITUDE MODULATION WITH A 'HALF-
VOLTAGE' $V_{SUB} (1/2) = 84$ VOLTS IS DEMONSTRATED
AT $\lambda_{SUB 0} = 1.15$ MICROMETERS WITH A SAMPLE 2.4
MM LONG.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-710 946 17/2 20/5
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

AN INFORMATION FEEDBACK APPROACH APPLIED TO AN
AMPLITUDE-MODULATED DIGITAL LASER COMMUNICATIONS
SYSTEM.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
MAR 70 97P DWORKIN, LARRY U. ;
REPT. NO. ECCM-3258
PROJ: DA-5016118443001

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
FEEDBACK), DIGITAL SYSTEMS, DIGITAL COMPUTERS,
AMPLITUDE MODULATION, INFORMATION THEORY, MONTE
CARLO METHOD, LASERS, PHOTONS, COUNT-RATE
METERS, ATTENUATION
IDENTIFIERS: *LASER COMMUNICATION SYSTEMS

(U)

(U)

THE USE OF PRECISION FEEDBACK IN A LASER
COMMUNICATION SYSTEM EMPLOYING AN AMPLITUDE-MODULATED
LASER TRANSMITTER AND PHOTOMULTIPLIER RECEIVER IS
CONSIDERED. POISSON STATISTICS ARE USED TO DESCRIBE
THE DISTRIBUTION OF EMITTED PHOTO ELECTRONS IN A
FIXED TIME INTERVAL FROM THE PHOTO EMISSIVE SURFACE
OF THE RECEIVER WHEN THE INCIDENT FIELD IS A MIXTURE
OF A SINGLE MODE LASER AND BROADBAND THERMAL NOISE.
THE USE OF A NOISELESS FEEDBACK PATH TO REDUCE THE
VARIANCE OF THE RECEIVED PHOTO ELECTRON COUNT IS
EXAMINED. A TECHNIQUE KNOWN AS 'FEEDBACK AVERAGING'
IS CONCEIVED AND THE FOLLOWING PROPERTIES ARE
DEMONSTRATED. (A) THE VARIANCE OF THE RECEIVED
PHOTO ELECTRON COUNTS IS SIGNIFICANTLY REDUCED OVER
THAT OBTAINED IN A SYSTEM WITHOUT FEEDBACK. (B)
THE EFFECTS OF BACKGROUND RADIATION AND SHOT NOISE
AT THE RECEIVER CAN BE REDUCED. (C) THE EFFECT
OF SLOW FADING ON THE MEAN ARRIVAL RATE OF PHOTONS IS
REDUCED. THIS IS ACHIEVED IN THE ABOVE SYSTEM WITH
THE SAME AVERAGE POWER AND ONLY SLIGHTLY MORE PEAK
POWER, IN MOST CASES, THAN THE SAME SYSTEM WITHOUT
FEEDBACK. THE APPROACH IS TREATED ANALYTICALLY, AND
SIMULATED ON A DIGITAL COMPUTER. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-710 955 17/2 20/5
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

AN INFORMATION FEEDBACK APPROACH APPLIED TO
POLARIZATION-MODULATED LASER COMMUNICATION
SYSTEMS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JUL 70 26P DWORKIN, LARRY U. ;
REPT. NO. ECOM-3314
PROJ: DA-5016118443001, DA-A-91-A-3801

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: DOCTORAL THESIS FROM POLYTECHNIC
INST. OF BROOKLYN, N. Y.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
FEEDBACK), DIGITAL SYSTEMS, DIGITAL COMPUTERS,
INFORMATION THEORY, PHOTONS, COUNT-RATE METERS,
ATTENUATION, LASERS, POLARIZATION, THESES (U)
IDENTIFIERS: *LASER COMMUNICATION SYSTEMS,
*POLARIZATION MODULATION (U)

THE USE OF AN INFORMATION FEEDBACK PROCEDURE,
CALLED 'FEEDBACK AVERAGING' IS APPLIED TO AN M-
ARY POLARIZATION MODULATED LASER
COMMUNICATION SYSTEM. THE SYSTEMS WITH AND
WITHOUT FEEDBACK, THAT ARE LIMITED BY PHOTON
FLUCTUATION, ARE CONSIDERED AND COMPARED. A
SIGNIFICANT IMPROVEMENT IN ERROR RATE OF A SYSTEM
WITH FEEDBACK IS DEMONSTRATED OVER A ONE-WAY SYSTEM
FOR A QUATERNARY SYSTEM SUBJECT TO INTENSITY
CONSTRAINT. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-710 956 17/2 20/5
ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

AN EXPERIMENTAL FEEDBACK AVERAGING LASER
COMMUNICATIONS SYSTEM.

(U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JUL 70 25P DWORKIN, LARRY U. ;
REPT. NO. ECOM-3315
PROJ: DA-5016118443001, AD-A-91-3901

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: DOCTORAL THESIS FROM POLYTECHNIC
INST. OF BROOKLYN, N. Y.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
AMPLITUDE MODULATION), GAS LASERS, ATTENUATORS,
PHOTOMULTIPLIERS, PHOTONS, COUNT-RATE METERS,
THESES

(U)

IDENTIFIERS: *LASER COMMUNICATION SYSTEMS, HELIUM
NEON LASERS

(U)

AN EXPERIMENTAL VERSION OF A 'FEEDBACK AVERAGING'
AMPLITUDE MODULATED LASER COMMUNICATIONS SYSTEM IS
DISCUSSED. THE ABILITY OF THE SYSTEM TO REDUCE THE
VARIANCE OF PHOTON ARRIVALS IS DEMONSTRATED
EXPERIMENTALLY. PROPERTIES OF A RECEIVER ESTIMATOR
CALCULATED IN PREVIOUSLY PUBLISHED REPORTS ARE
VERIFIED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-714 358 20/6 20/5
NATIONAL RESEARCH COUNCIL OF CANADA OTTAWA (ONTARIO) DIV O
PHYSICS

PRODUCTION OF SUBNANOSECOND LIGHT PULSES WITH
THE AID OF A LASER-TRIGGERED SPARK GAP,

(U)

JUN 70 4P ALCOCK, A. J. ; RICHARDSON,
M. C. ;
MONITOR: NRC 11487

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN OPTICS COMMUNICATIONS, V2 N2
P65-68 JUL 70. NO COPIES FURNISHED.

DESCRIPTORS: (*LIGHT PULSES, LASERS),
ELECTROOPTICS, LIGHT TRANSMISSION, LIGHT
COMMUNICATION SYSTEMS, CANADA
IDENTIFIERS: SPARK GAPS, RUBY LASERS

(U)

(U)

SUBNANOSECOND PULSES, HAVING RISE AND FALL TIMES
NOT EXCEEDING 300 PSEC, HAVE BEEN SELECTED FROM THE
OUTPUT OF A SINGLE MODE RUBY LASER. THE PULSE
WIDTH, APPROXIMATELY 700 PSEC, AGREES WELL WITH THE
OBSERVED BROADENING OF THE SPECTRUM OF THE PULSE.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-714 718 17/2 20/5
GEORGETOWN UNIV WASHINGTON D C DEPT OF PHYSICS

FREQUENCY-MODULATED LASER COMMUNICATION
SYSTEM,

(U)

OCT 69 5P BORSUK, GERALD M. ITHALER,
WILLIAM J. ;
CONTRACT: F44620-68-C-0017
PROJ: AF-7921
MONITOR: AFOSR 70-2611TR

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN IEEE TRANSACTIONS ON SONICS
AND ULTRASONICS, VSU-17 N4 P207-209 OCT 70.

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS, GAS
LASERS), (*GAS LASERS, FREQUENCY MODULATION),
VIDEO SIGNALS, ULTRASONIC RADIATION,
PERFORMANCE (ENGINEERING)

(U)

IDENTIFIERS: HELIUM NEON LASERS, ACOUSTOOPTIC
INTERACTIONS

(U)

AN ULTRASONIC MODULATION CELL UTILIZING THE
RAMAN-NATH EFFECT IS USED TO IMPRESS A FREQUENCY-
MODULATED VIDEO SIGNAL ON A HELIUM-NEON LASER
CARRIER. A LONGITUDINAL ULTRASONIC WAVE
PROPAGATING IN THE ULTRASONIC MODULATION CELL
EFFECTIVELY ACTS AS A DOPPLER SHIFTING PHASE
GRATING FOR COLLIMATED MONOCHROMATIC-LIGHT INCIDENT
NORMAL TO THE DIRECTION OF PROPAGATION OF THE
ULTRASONIC WAVE. A TECHNIQUE HAS BEEN DEVELOPED BY
WHICH TWO ULTRASONIC ELEMENTS PRODUCE A
PSEUDOSTANDING WAVE AT THE VARIOUS MODULATING
FREQUENCIES IMPOSED ON THE ELEMENTS. ALL DOPPLER-
SHIFTED FREQUENCY COMPONENTS IN THE LASER BEAM ARE
SCATTERED BACK INTO THE ZERO ORDER. AN OPTICAL
HETERODYNE DETECTOR AND FM DISCRIMINATOR ARE USED
TO RECOVER THE SIGNAL. THE ABILITY TO FREQUENCY
MULTIPLEX DISTINCT CHANNELS ONTO THE LASER BEAM,
USING ACOUSTIC UNITS IN TANDEM, IS DEMONSTRATED.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-714 895 20/5
BOLT BERANEK AND NEWMAN INC CAMBRIDGE MASS

PROBLEMS IN THE THEORY OF LASER
MODULATION.

(U)

DESCRIPTIVE NOTE: FINAL REPT.,
OCT 70 20P FOX, H. L. ;
REPT. NO. BBN-2060
CONTRACT: N00014-68-C-0199

UNCLASSIFIED REPORT

DESCRIPTORS: (*GAS LASERS, COHERENT RADIATION),
(*COHERENT RADIATION, MODULATION), ATOMIC ENERGY
LEVELS, ZEEMAN EFFECT, MATHEMATICAL ANALYSIS,
QUANTUM MECHANICS, LIGHT TRANSMISSION,
ELECTROOPTICS

(U)

IDENTIFIERS: HELIUM NEON LASERS, *QUANTUM
ELECTRONICS

(U)

THE REPORT DISCUSSES THE PROBLEM OF INTRINSIC
INTERNAL MODULATION OF A LASER - MODULATION BY
ALTERING THE STATE OF THE ACTIVE LASER MEDIUM.
CONTROLLED MODULATION FOR INFORMATION TRANSMISSION
AND UNCONTROLLED NOISE-PRODUCING MODULATIONS ARE
CONSIDERED. TO DEMONSTRATE A CORRESPONDENCE-
PRINCIPLE DERIVATION OF THE CLASSICAL LASER EQUATIONS
OF LAMB, IT IS SHOWN THAT THE LIFETIME DISTORTIONS
PREVIOUSLY REPORTED MUST BE INCLUDED IN A QUANTUM
TREATMENT. THE PROBLEM OF SOUND WAVES AND TIME-
DEPENDENT ZEEMAN-EFFECT MODULATION IS DISCUSSED.
(AUTHOR)

(U)

UNCLASSIFIED

UDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-716 847 20/5
CALIFORNIA UNIV IRVINE SCHOOL OF ENGINEERING

INVESTIGATION OF SPECTRAL AND STATISTICAL
PROPERTIES OF SINGLE-MODE CW LASERS. (U)

DESCRIPTIVE NOTE: FINAL REPT, 1 JUL 69-30 JUN 70,
JUL 70 46P GAMO, HIDEYA ; CHUANG, SHIH-

SHUNG ;

CONTRACT: F19628-69-C-0147

PROJ: AF-4645

TASK: 464502

MONITOR: AFCRL 70-0468

UNCLASSIFIED REPORT

DESCRIPTORS: (*GAS LASERS, POWER SPECTRA),
CARBON DIOXIDE, IRASERS, SPECTRA (INFRARED),
STOCHASTIC PROCESSES, PROBABILITY DENSITY FUNCTIONS,
LIGHT COMMUNICATION SYSTEMS (U)

IDENTIFIERS: *CARBON DIOXIDE LASERS, CONTINUOUS
WAVE LASERS, VAN DER POL DIFFERENTIAL EQUATION (U)

VARIANCE AND POWER SPECTRA OF INTENSITY
FLUCTUATIONS OF A SINGLE MODE CW CO₂ 10.6 MICRON
GAS LASER HAVE BEEN MEASURED BY USING A COPPER-DOPED
GERMANIUM DETECTOR AND ANALOG INSTRUMENTATION.
RMS INTENSITY FLUCTUATIONS ABOVE THE OSCILLATION
THRESHOLD WAS SMALLER THAN 0.3% OF THE AVERAGE
INTENSITY. THE MEASUREMENTS NEAR THE OSCILLATION
THRESHOLD, HOWEVER, WERE NOT ACCURATE, BECAUSE THE
ACOUSTIC DISTURBANCE DUE TO ACOUSTICAL NOISE, BUBBLES
IN THE COOLING WATER AND TEMPERATURE FLUCTUATIONS IN
THE PLASMA TUBE WERE PREDOMINANT OVER THE
FLUCTUATIONS DUE TO SPONTANEOUS EMISSION. THE POWER
SPECTRUM OBSERVED AT FREQUENCIES ABOVE 10KHZ SHOWED
FEATURES CHARACTERISTIC TO THE LASER MODEL OF VAN
DER POL OSCILLATOR DRIVEN BY THE RANDOM NOISE.
IMPROVEMENTS OF CO₂ GAS LASER DESIRABLE FOR
FURTHER INVESTIGATION ARE DISCUSSED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-716 876 20/5
ILLINOIS UNIV URBANA GASEOUS ELECTRONICS LAB

FREQUENCY SHIFT AT 3.39 MICRONS DUE TO
COMPETITION BY 6328-A LASER RADIATION, (U)

APR 69 4P KU, R. T. ; VERDEYEN, J. T.
; CHERRINGTON, B. E. ;
CONTRACT: AF 33(615)-5248
PROJ: AF-7073
TASK: 707300
MONITOR: ARL 70-0289W

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN JNL. OF APPLIED PHYSICS,
V40 N9 P3861-3862 AUG 69.

DESCRIPTORS: (*GAS LASERS, AMPLITUDE MODULATION),
(*INFRARED) RADIATION, FREQUENCY SHIFT, HELIUM,
NEON, GAIN, INTERACTIONS, DEMODULATION (U)
IDENTIFIERS: *HELIUM NEON LASERS (U)

REPORTED ARE THE RESULTS OF A RELATED INVESTIGATION
IN WHICH THE FREQUENCY OF A MODE OSCILLATING AT 3.39
MICROMETERS IS SHIFTED DUE TO AMPLITUDE MODULATION OF
THE MODES AT 6328A. (AUTHOR: (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-720 937 20/6 17/2
SIGNALS RESEARCH AND DEVELOPMENT ESTABLISHMENT
CHRISTCHURCH (ENGLAND)

DETERMINATION OF THE SCATTERING LOSS IN
OPTICAL GLASS FIBRES,

(U)

DEC 70 28P ORSBORNE, MARGARET A. ;
REPT. NO. SRDE-70064
MONITOR: TRC BR-23407

UNCLASSIFIED REPORT

DESCRIPTORS: (*FIBER OPTICS, LIGHT TRANSMISSION),
(*LIGHT COMMUNICATION SYSTEMS, TRANSMISSION
LINES), SCATTERING, GAIN, POWER SPECTRA, TEST
METHODS, TEST EQUIPMENT, GREAT BRITAIN

(U)

THE PAPER DESCRIBES THE EQUIPMENT AND METHOD USED
TO DETERMINE THE TOTAL LOSS OF POWER DUE TO ALL FORMS
OF SCATTER WITHIN MULTIMODE OPTICAL GLASS FIBRES.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-721 372 20/5 17/2
MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF ELECTRICAL
ENGINEERING

THE BEHAVIOR OF LASER MODES IN A MEDIUM
WITH TIME VARYING DIELECTRIC CONSTANT. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
AUG 70 170P WHITNEY, COLIN GORDON ;
REPT. NO. TR-9
CONTRACT: DA-31-124-ARO(D)-92, SD-90
PROJ: DA-2-0-01051-B-700
MONITOR: AROD 4109:12-P

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, FREQUENCY MODULATION),
(*IRASERS, LIGHT COMMUNICATION SYSTEMS),
ULTRASONIC RADIATION, FREQUENCY SHIFT CONVERTERS,
GALLIUM ARSENIDES, PARTIAL DIFFERENTIAL EQUATIONS,
DIELECTRIC PROPERTIES, GAIN, AMPLITUDE MODULATION,
THESES (U)

IDENTIFIERS: *GALLIUM ARSENIDE LASERS,
*SEMICONDUCTOR LASERS, INJECTION LASERS (U)

THE EFFECT, ON SEMICONDUCTOR LASER MODES, OF A
TIME-VARYING MODULATION OF THE COMPLEX DIELECTRIC
CONSTANT OF THE ACTIVE REGION OF THE LASER, IS
CONSIDERED. IT IS SEEN THAT THE MAIN EFFECT IS TO
PRODUCE FREQUENCY MODULATION ASSOCIATED WITH
MODULATION OF THE REAL PART OF THE DIELECTRIC
CONSTANT WHILE MODULATION OF THE IMAGINARY PART GIVES
RISE TO AMPLITUDE MODULATION. TWO METHODS FOR
PRODUCING THE MODULATION ARE CONSIDERED. THE FIRST,
PRESSURE VIA ULTRASONIC WAVES, PRODUCES PURE
FREQUENCY MODULATION IN IMPURE MATERIAL. THE
SECOND, MODULATION OF THE INJECTION, RESULTS IN BOTH
AMPLITUDE AND FREQUENCY MODULATION. EXPERIMENTS TO
CONFIRM THIS ANALYSIS WERE CARRIED OUT ON A CW
GAAS INJECTION LASER. THE MODULATED LASER
SPECTRUM WAS OBSERVED WITH A FABRY-PEROT
INTERFEROMETER. HIGH RESOLUTION MEASUREMENTS ON
THE PULSED SPECTRAL SHIFT OF A GAAS LASER AT
77K AND 4.2K WERE PERFORMED USING A FABRY-
PEROT INTERFEROMETER. THE FEASIBILITY OF
DETECTING MODULATION ON A PULSED SEMICONDUCTOR LASER
WAS DEMONSTRATED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-722 308 17/2
FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OHIO

MOTION PICTURE AND TELEVISION ENGINEERING.
VOLUME 14, NUMBER 6, 1970 (SELECTED
ARTICLES), (U)

JAN 71 24P RAPOPORT, B. I. ; VAINSHTEIN,
G. G. ;
REPT. NO. FTD-MT-24-297-70

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: EDITED MACHINE TRANS. OF TEKNIKA
KINO I TELEVIDENIYA (USSR) V14 N6 P51-57 1970, BY
RENE E. COURVILLE.

DESCRIPTORS: (*TELEVISION COMMUNICATION SYSTEMS,
GRAPHICS), (*STEREOSCOPIC DISPLAY SYSTEMS,
TELEVISION COMMUNICATION SYSTEMS), SCANNING,
LASERS, USSR (U)
IDENTIFIERS: TRANSLATIONS, *HOLOGRAPHY (U)

DISCUSSED ARE POSSIBILITIES OF DESIGNING A
HOLOGRAPHIC TELEVISION SYSTEM. GIVEN ARE
EXPERIMENTAL TEST RESULTS OF THE SYSTEM DURING THE
LONG IMAGE DURATION AND ALSO THE PROSPECTS OF USING
SPECIAL TELEVISION SYSTEMS WITH THE TRACKING SCANNING
FOR CONTOUR IMAGE TRANSMISSION. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-722 475 20/6
HUGHES AIRCRAFT CO MALIBU CALIF

RESEARCH IN INTERACTION OF COHERENT LIGHT
WITH SOLIDS AND WITH TURBULENT ATMOSPHERES. (U)

DESCRIPTIVE NOTE: FINAL SCIENTIFIC REPT.,
FEB 71 238P BROWN, W. P. ;
CONTRACT: AF 49(638)-1607
MONITOR: AFOSR TR-71-0582

UNCLASSIFIED REPORT

DESCRIPTORS: (*COHERENT RADIATION, LIGHT
TRANSMISSION), (*LIGHT TRANSMISSION- MATHEMATICAL
ANALYSIS), INTERACTIONS, TURBULENCE, SCATTERING,
REFRACTIVE INDEX, PARTIAL DIFFERENTIAL EQUATIONS,
BOUNDARY VALUE PROBLEMS, LASERS, DIFFRACTION,
APPROXIMATION(MATHEMATICS) (U)
IDENTIFIERS: ATMOSPHERIC ATTENUATION, RYTOV
APPROXIMATION, BORN APPROXIMATION (U)

THE REPORT SUMMARIZES THE OBJECTIVES AND RESULTS OF
RESEARCH ON PROPAGATION IN RANDOM MEDIA CONDUCTED ON
CONTRACT AF49(638)-1607. THE PRINCIPAL
RESULTS INCLUDE THE DERIVATION OF A VALIDITY
CONDITION FOR THE RYTOV APPROXIMATION, THE
DEVELOPMENT OF DIAGRAMMATIC SUMMATION TECHNIQUES FOR
TREATING MULTIPLE SCATTERING EFFECTS, AND THE
DEVELOPMENT OF NONDIAGRAMMATIC TECHNIQUES FOR
DERIVING EQUATIONS FOR THE STATISTICAL MOMENTS OF A
WAVE PROPAGATING THROUGH A RANDOM MEDIUM.
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-722 865 20/12
CITY COLL RESEARCH FOUNDATION NEW YORK

OPTICAL PROPERTIES OF SEMICONDUCTORS. (U)

DESCRIPTIVE NOTE: FINAL SCIENTIFIC REPT. 1 JAN 69-31
MAR 71,

APR 71 85P TZOAR, NARKIS ;
CONTRACT: AF-AFOSR-1676-69
PROJ: AF-9763
TASK: 976302
MONITOR: AFOSR TR-71-1095

UNCLASSIFIED REPORT

DESCRIPTORS: (*SEMICONDUCTORS, OPTICAL PROPERTIES), (*BAND THEORY OF SOLIDS, SEMICONDUCTORS), ELECTRICAL CONDUCTANCE, DIELECTRIC PROPERTIES, RAMAN SPECTROSCOPY, IRASERS, CYCLOTRON RESONANCE PHENOMENA, MAGNETIC FIELDS, LIGHT TRANSMISSION, PLASMA MEDIUM, X RAYS, PHONONS (U)
IDENTIFIERS: RAMAN SCATTERING, ELECTRON PHONON INTERACTIONS, SOLID STATE PLASMAS, ELECTRON GAS, PLASMONS (U)

THE PROGRAM OF INVESTIGATIONS WAS DESIGNED TO LEAD TO A BETTER UNDERSTANDING OF THE ELECTRONIC STRUCTURE AND THE OPTICAL PROPERTIES OF SEMICONDUCTING MATERIALS USED IN MODERN SOLID STATE ELECTRONIC CIRCUITRY FOR DETECTION, AMPLIFICATION AND COMMUNICATION IN AEROSPACE ENVIRONMENTS. THIS IS ESSENTIAL TO THE DESIGN OF OPTICAL DETECTORS AND DEVICES. THE STUDY INVOLVED CALCULATIONS OF THE HIGH-FREQUENCY CONDUCTIVITY AND DIELECTRIC PROPERTIES OF SEMICONDUCTORS INCLUDING ANISOTROPIC FEATURES, TAKING INTO ACCOUNT ELECTRONIC AND IONIC CORRELATIONS AND FLUCTUATIONS. EFFECTS OF MAGNETIC FIELDS, IMPURITIES AND BAND STRUCTURE. THE PRINCIPAL TECHNIQUE USED WAS THE MANY-BODY PERTURBATION METHOD, EXTENDED TO INCLUDE VALENCE STATES, STRONG ELECTRON-PHONON AND RADIATION INTERACTIONS AND THE EFFECT OF LOCAL IMPURITY POTENTIALS. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-723 834 17/2 20/5
LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF PALO ALTO
RESEARCH LAB

WIDEBAND LASER COMMUNICATIONS: AN
ANNOTATED BIBLIOGRAPHY,

(U)

APR 71 137P TEMPLETON, JOE H. ;
REPT. NO. LMSC-N-JY-71-3, LMSC-SB-71-1
CONTRACT: N00014-71-C-0049, ARPA ORDER-306

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
BIBLIOGRAPHIES), (*LASERS, LIGHT COMMUNICATION
SYSTEMS), BROADBAND, OPTICAL PHENOMENA,
INFORMATION THEORY, GAS LASERS, TRACKING,
ELECTROOPTICS, DIGITAL SYSTEMS, SIGNAL-TO-NOISE
RATIO, ABSTRACTS

(U)

IDENTIFIERS: LASER COMMUNICATION SYSTEMS

(U)

261 HIGHLY SPECIFIC ABSTRACT/CITATIONS ON THE SUBJECT
OF WIDEBAND LASER COMMUNICATIONS MAKE UP THIS
BIBLIOGRAPHY. JOURNAL ARTICLES, BOOKS, AND
GOVERNMENT REPORTS HAVE BEEN CHOSEN FOR INCLUSION
FROM ABSTRACTS APPEARING IN THE NASA STAR, TAB,
U.S.G.R.D.R., AND IAA. COVERAGE WAS
FOR THE YEARS 1964-1970. CITATIONS ARE ARRANGED
ALPHABETICALLY BY AUTHOR. AMONG THE SUBJECTS
COVERED ARE: OPTICAL COMMUNICATION AT HIGH DATA
RATES, OPTICAL BEAM ACQUISITION AND FINE TRACKING,
AND ATMOSPHERIC EFFECTS ON LASER BEAM PROPAGATION.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-723 902 20/5 17/2
CALIFORNIA INST OF TECH PASADENA

SEMI-ANNUAL TECHNICAL REPORT ON PROGRESS
FOR THE PERIOD JULY 1970 - DECEMBER 1970, (U)

70 13P LAUSSADE, JEAN-PIERRE ; YARIV,
AMON ; CASPERSON, LEE ;
CONTRACT: DAHC04-68-C-0041, ARPA ORDER-675

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN VARIOUS JNLS.

DESCRIPTORS: (*COHERENT RADIATION, LIGHT
TRANSMISSION), (*GAS LASERS, GAIN), LIGHT
COMMUNICATION SYSTEMS, TURBULENCE, REFRACTIVE INDEX,
CORRELATION TECHNIQUES, DISTRIBUTION FUNCTIONS,
ATMOSPHERE (U)

IDENTIFIERS: XENON LASERS, WAVE EQUATIONS,
HELIUM XENON LASERS (U)

CONTENTS: A THEORETICAL STUDY OF OPTICAL WAVE
PROPAGATION THROUGH RANDOM ATMOSPHERIC TURBULENCE;
LONGITUDINAL MODES IN A HIGH-GAIN LASER. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-723 972 20/6
ILLINOIS UNIV URBANA DEPT OF ELECTRICAL ENGINEERING

SPATIAL MODULATION OF LIGHT USING SURFACE
WAVES IN AN INTERFEROMETER, (U)

FEB 70 4P HUNSINGER, BILL J. ;
HOLSHOUSER, D. ;
CONTRACT: AF-AFOSR-390-67
PROJ: AF-9767
TASK: 976702
MONITOR: AFOSR TR-71-1461

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN APPLIED PHYSICS LETTERS,
V16 N7 P272-273, 1 APR 70.
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH
MAGNAVOX CO., URBANA, ILL. REVISION OF REPORT
DATED 12 DEC 69.

DESCRIPTORS: (*LIGHT TRANSMISSION, PHASE
MODULATION), (*DIFFRACTION GRATINGS, LIGHT
TRANSMISSION), INTERFEROMETERS, LASERS, FOURIER
ANALYSIS, PIEZOELECTRIC CRYSTALS (U)
IDENTIFIERS: SWIM(SURFACE WAVE INTERFERENCE
MODULATORS), SURFACE WAVE INTERFERENCE
MODULATORS, SIGNAL PROCESSING, LITHIUM NIOBATES,
SURFACE WAVES, ACOUSTIC SURFACE WAVES,
ACOUSTOOPTIC INTERACTIONS (U)

AN OPTICAL PHASE GRATING HAS BEEN GENERATED BY
INTRODUCING SURFACE WAVES ON ONE FACE OF A FABRY-
PEROT INTERFEROMETER. THIS DEVICE CALLED SWIM
(SURFACE WAVE INTERFERENCE MODULATOR)
PRODUCES A DIFFRACTION PATTERN AT THE FOURIER PLANE
IN WHICH THE LIGHT INTENSITY OF THE FIRST-ORDER
MODULATED BEAM IS 1% OF THE ZEROth ORDER WITH AN
ACOUSTIC POWER OF 0.85MW/MM BEAM WIDTH. FIRST-
ORDER INTENSITIES GREATER THAN 10% HAVE BEEN
REALIZED; HOWEVER, THE PROCESS IS NOT LINEAR AT THIS
MODULATION DEPTH. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-724 028 20/6
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

A BIBLIOGRAPHY ON OPTICAL MODULATORS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JAN 71 32P ELLIS, B. ; WALTON, A. K. ;
REPT. NO. RAE-TR-71009
MONITOR: IRC BR-23770

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH
SHEFFIELD UNIV., YORKSHIRE (ENGLAND), DEPT. OF
PHYSICS.

DESCRIPTORS: (*LIGHT TRANSMISSION, MODULATION),
(*MODULATORS, *BIBLIOGRAPHIES), ELECTROOPTICS,
LASERS, IRASERS, OPTICAL MATERIALS, OPTICAL
INSTRUMENTS, GREAT BRITAIN, MAGNETO-OPTIC EFFECT (U)
IDENTIFIERS: *OPTICAL MODULATORS, ACOUSTOOPTIC (U)
MODULATORS

APPROXIMATELY 250 REFERENCES, MANY OF WHICH CARRY
BRIEF ANNOTATION, ARE PROVIDED, COVERING THE FIELD OF
OPTICAL MODULATION OVER THE SPAN 1950-1970.
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-724 414 9/4 17/2
ROCHESTER UNIV N Y DEPT OF PHYSICS AND ASTRONOMY

INFORMATION RATE IN AN OPTICAL COMMUNICATION
CHANNEL,

(U)

AUG 70 10P JODOIN, R. ; MANDEL, L. ;
CONTRACT: F44620-69-C-0086
PROJ: AF-9767
TASK: 976702
MONITOR: AFOSR TR-71-1573

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN JNL. OF THE OPTICAL
SOCIETY OF AMERICA, V61 N2 P191-198 FEB 71.

DESCRIPTORS: (*INFORMATION THEORY, STATISTICAL
ANALYSIS), (*LIGHT COMMUNICATION SYSTEMS,
INFORMATION THEORY), INTEGRALS, PROBABILITY
DENSITY FUNCTIONS, LASERS, LIGHT TRANSMISSION,
CODING

(U)

AN OPTICAL COMMUNICATION CHANNEL IS ANALYZED, IN
WHICH A LIGHT BEAM IS AMPLITUDE MODULATED AT THE
SOURCE BY A FILTER OF CONTINUOUSLY VARIABLE
TRANSMITTANCE, AND THE DETECTOR COUNTS THE RECEIVED
PHOTONS. SUCH A COMMUNICATION CHANNEL HAS INTRINSIC
NOISE LIMITATIONS BECAUSE THERE IS NOT A ONE-TO-ONE
CORRESPONDENCE BETWEEN THE MODULATED BEAM POWER AND
THE NUMBER OF COUNTS REGISTERED. THE INFORMATION
RATES ACHIEVABLE WITH SINGLE-MODE AND MULTIMODE
LASERS ARE EVALUATED AS FUNCTIONS OF THE MEAN NUMBER
N OF DETECTED PHOTONS PER SYMBOL, FOR SEVERAL
DIFFERENT INPUT STATISTICS. FOR LARGE N THE
INFORMATION RATE INCREASES LOGARITHMICALLY WITH N.
IT IS SHOWN THAT, WHEN THE SYMBOL LENGTH IS SHORT,
THERE IS A MINIMUM NUMBER OF INDEPENDENT MODES FOR
WHICH THE MULTIMODE LASER GIVES A GREATER INFORMATION
RATE THAN THE SINGLE-MODE LASER, IF THE LASER POWER
IS EQUALLY DIVIDED AMONG ALL THE MODES, AND THE POWER
PER MODE IS REGARDED AS CONSTANT. HOWEVER, FOR EVEN
MODERATE NUMBERS OF DETECTED PHOTONS PER SYMBOL, THIS
MINIMUM NUMBER OF MODES IS SO GREAT THAT THE SINGLE-
MODE LASER IS TO BE PREFERRED. WHEN THE LIGHT BEAM
IS DERIVED FROM A THERMAL SOURCE, THE INFORMATION
RATE IN THE CHANNEL IS, IN EFFECT, GOVERNED BY THE
SAME EQUATIONS AS THOSE FOR THE SINGLE-MODE LASER, SO
LONG AS THE DETECTOR AREA IS LIMITED TO A COHERENCE
AREA. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-725 067 20/5
CASE WESTERN RESERVE UNIV CLEVELAND OHIO DIV OF
ELECTRICAL SCIENCES AND APPLIED PHYSICS

STARK EFFECT MODULATION STUDIES. (U)

DESCRIPTIVE NOTE: FINAL REPT. 18 MAR 68-31 DEC 70,
MAR 71 73P PAO, YOH-HAN ; CLASPY, PAUL

C. ; JOHNSON, W. B. ;

CONTRACT: F19628-68-C-0183

PROJ: AF-4645

TASK: 464507

MONITOR: AFCRL 71-0179

UNCLASSIFIED REPORT

DESCRIPTORS: (*COHERENT RADIATION, FREQUENCY
MODULATION), (*GAS LASERS, STARK EFFECT),
GAIN, HARMONIC ANALYSIS, ABSORPTION SPECTRUM,
IRASERS (U)

IDENTIFIERS: INTERMEDIATE INFRARED RADIATION, Q
SWITCHING, *CARBON DIOXIDE LASERS (U)

IT HAS BEEN DETERMINED THAT IT IS PRACTICAL TO USE
THE MOLECULAR STARK EFFECT IN GASES TO MODULATE
LASER RADIATION IN THE 10 MICRON REGION. A LARGE
NUMBER OF SUITABLE MODULATOR GAS CONSTITUENTS HAVE
BEEN STUDIED AND PARAMETERS GOVERNING GAS CELL
MODULATOR DESIGN HAVE ALSO BEEN IDENTIFIED. SUCH
MODULATORS MAY BE USED BOTH WITHIN AND EXTERNAL TO
THE LASER CAVITY. IN INTRA CAVITY CONFIGURATIONS,
LARGE MODULATION DEPTHS ARE EASILY OBTAINED WITH LOW
MODULATOR POWER. RESULTS OF THEORETICAL STUDIES
INDICATE THAT WITHIN THE FREQUENCY RANGES OF
PRACTICAL INTEREST, THERE IS NO INTRINSIC LIMIT TO
THE FREQUENCY RESPONSE. HOWEVER WHEN MODULATING
FREQUENCY IS LARGER THAN THE VALUE OF THE HOMOGENEOUS
LINEWIDTH, THERE IS A DECREASE IN EFFECTIVENESS.
EXPERIMENTAL RESULTS SHOWING NON-DISPERSIVE
MODULATION AT FREQUENCIES TO 30 MEGAHERTZ HAVE BEEN
OBTAINED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-725 103 17/8 20/6
PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF ELECTRICAL
ENGINEERING

APPROXIMATE PHOTOCOUNT STATISTICS FOR
COHERENT AND CHAOTIC RADIATION OF ARBITRARY
SPECTRAL SHAPE,

(U)

AUG 70 11P LACHS, GERARD ;
CONTRACT: DA-31-124-ARO(D)-383
PROJ: DA-2-0-061102-B-31-E
MONITOR: AROD 5659:12-E

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN JNL. OF APPLIED PHYSICS,
V42 N2 P602-609 FEB 71.

SUPPLEMENTARY NOTE: SPONSORED IN PART BY THE NATIONAL
AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON,
D. C.

DESCRIPTORS: (*LIGHT, DETECTION), (*COHERENT
RADIATION, DETECTION), (*PHOTONS, COUNTING
METHODS), LIGHT COMMUNICATION SYSTEMS, LASERS,
STATISTICAL ANALYSIS

(U)

A METHOD FOR COMPUTING THE APPROXIMATE PHOTOCOUNT
STATISTICS FOR GAUSSIAN LIGHT IS PRESENTED. THIS
METHOD MAY BE USED FOR THE SUPERPOSITION OF COHERENT
RADIATION WITH CHAOTIC RADIATION OF ARBITRARY
SPECTRAL SHAPE. DATA IS PRESENTED FOR GAUSSIAN-,
TRIANGULAR-, AND SQUARE-SHAPED SPECTRA AS WELL AS FOR
LORENTZIAN-SHAPED SPECTRA. THE RESULTS SHOW THAT
THE PHOTOCOUNT STATISTICS ARE SIGNIFICANTLY DEPENDENT
UPON SPECTRAL SHAPE FOR INTERMEDIATE TIME-BANDWIDTH
PRODUCTS. THE RESULTS ALSO SHOW THAT THE BEDARD,
CHANG, AND MANDEL APPROXIMATION GIVES A BETTER
FIT TO A GAUSSIAN-SHAPED SPECTRUM THAN TO A
LORENTZIAN-SHAPED SPECTRUM. SIGNIFICANT
DIFFERENCES BETWEEN THE PHOTOCOUNT STATISTICS FOR A
TIME-BANDWIDTH PRODUCT OF 10 AND POISSON STATISTICS
WERE ALSO OBTAINED; EVEN FOR A SIGNAL-TO-NOISE RATIO
OF 40:1. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-726 139 20/5
INFORMATICS TISCO INC RIVERDALE MD

BIBLIOGRAPHY OF SOVIET LASER
DEVELOPMENTS.

(U)

DESCRIPTIVE NOTE: INTERIM REPT. NO. 3, JAN-MAR 71,
APR 71 57P ALLEN, LIDA L. HIBBEN,
STUART G. ;
CONTRACT: F44620-70-C-0081, ARPA ORDER-1622
PROJ: AF-62701D
MONITOR: AFOSR TR-71-1777

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, USSR), (*BIBLIOGRAPHIES,
LASERS), DYES, GAS LASERS, IRASERS, OPTICAL
EQUIPMENT COMPONENTS, SCIENTIFIC RESEARCH, COHERENT
RADIATION

(U)

IDENTIFIERS: QUANTUM ELECTRONICS, SOLID STATE
LASERS, SEMICONDUCTOR LASERS, GALLIUM ARSENIDE
LASERS, RUBY LASERS, GLASS LASERS, INJECTION
LASERS, LIQUID LASERS, CHEMICAL LASERS,
ULTRAVIOLET LASERS, HOLOGRAPHY, LASER
MATERIALS

(U)

OF ALL MATERIAL REVIEWED, THE MAJOR YIELD HAS BEEN
FROM THE APPROXIMATELY 300 PERIODICALS WHICH ARE
KNOWN TO REPORT THE MOST ADVANCED AND INTERESTING
FINDINGS IN SOVIET LASER TECHNOLOGY. THE PERIOD
COVERED IS THE FIRST QUARTER OF 1971, AND INCLUDES
ALL LASER-RELATED ARTICLES RECEIVED BY US IN THAT
INTERVAL. THE STRUCTURE AND SELECTION CRITERIA ARE
THE SAME AS USED IN THE FIRST REPORT. SOMEWHAT
BROADENED SELECTION CRITERIA HAVE BEEN USED FOR ITEMS
PERTINENT TO CHEMICAL LASERS, IN VIEW OF THE
EXPANDING POSSIBILITIES IN THIS TECHNOLOGY. OUR
LITERATURE SEARCH ALSO REVEALS AN INCREASED EMPHASIS
ON HOLOGRAPHIC STUDIES, AS WELL AS ON USES OF
STIMULATED RAMAN SCATTERING EFFECTS IN
SPECTROSCOPY. OTHER ITEMS WORTHY OF MENTION ARE
TWO ARTICLES ON ULTRAVIOLET LASER AND ONE ON USE OF
AN ARGON ION LASER FOR UNDER WATER TV TRANSMISSION.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-727 583 20/6 20/5 17/5
RAND CORP SANTA MONICA CALIF

ON THE PHASE STRUCTURE AND MUTUAL COHERENCE
FUNCTION OF AN OPTICAL WAVE IN A TURBULENT
ATMOSPHERE,

(U)

JUN 71 26P LUTOMIRSKI, R. F. ; YURA, H.
T. ;
REPT. NO. RM-6266-1-ARPA
CONTRACT: DAHC15-67-C-0141, ARPA ORDER-189-1

UNCLASSIFIED REPORT

DESCRIPTORS: (*COHERENT RADIATION, *LIGHT
TRANSMISSION), ATMOSPHERE, TURBULENCE, POWER
SPECTRA, INFRARED DETECTORS, SIGNAL-TO-NOISE RATIO,
LASERS
IDENTIFIERS: WAVE EQUATIONS

(U)

(U)

THE PRESENT WORK SHOWS THAT THE MOST COMMONLY USED
EXPRESSION FOR THE MUTUAL COHERENCE FUNCTION (MCF)
FOR AN OPTICAL WAVE PROPAGATING IN A TURBULENT
ATMOSPHERE IS, IN GENERAL, INCORRECT. THIS
EXPRESSION IS BASED ON AN UNPHYSICAL EXTRAPOLATION OF
THE KOLMOGOROV SPECTRUM. ALONG AN ATMOSPHERIC
PATH, WITH SPECIFIED TURBULENCE PARAMETERS, THE NEW
MCF IS SHOWN TO IMPLY GREATER RESOLUTION, LESS BEAM
SPREADING, AND GREATER HETERODYNE SIGNAL-TO-NOISE
RATIOS THAN INDICATED BY PREVIOUS CALCULATIONS. BY
COMPARING THESE RESULTS WITH THOSE PREVIOUSLY
OBTAINED FOR HETERODYNE DETECTION, THE PERCENTAGE
ERRORS IN THE PREVIOUS CALCULATIONS ARE SHOWN TO
INCREASE WITH DECREASING PROPAGATION PATHS. IN
PARTICULAR, WHERE IT WAS FORMERLY THOUGHT THAT THE
ATMOSPHERE LIMITED THE EFFECTIVE COHERENT DETECTION
SIZE IN HETERODYNE DETECTION AT ALL RANGES, THE
PRESENT CALCULATION REVEALS THAT OVER SUFFICIENTLY
SHORT PATHS, THERE IS NO SIZE LIMIT IMPOSED BY THE
ATMOSPHERE. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-728 101 20/5

ARMY ELECTRONICS COMMAND FORT MONMOUTH N J

A STUDY OF LASER RESONATORS AND MODE-
LOCKING.

(U)

DESCRIPTIVE NOTE: RESEARCH AND DEVELOPMENT TECHNICAL
REPT.,

MAY 71 48P WOLFE, MARTIN I. ;
REPT. NO. ECOM-3422
PROJ: DA-1-H-662701-A-448
TASK: 1-H-662701-A-44804

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, OPTICAL PROPERTIES),
LIGHT COMMUNICATION SYSTEMS, WAVE FUNCTIONS,
FREQUENCY SHIFT, REFRACTION, DOPPLER EFFECT
IDENTIFIERS: MODE LOCKED LASERS, LASER
MATERIALS

(U)

(U)

THE FIRST PART OF THE REPORT REPRESENTS A
THEORETICAL STUDY OF CONFOCAL RESONATORS. THE
SECOND PART CONSISTS OF A STUDY OF MODE-LOCKING AND
TECHNIQUES THAT USE MODE-LOCKED LASERS. THE REPORT
IS INTENDED TO PRESENT A DETAILED ANALYSIS OF A
CONFOCAL RESONATOR IN ORDER TO ILLUSTRATE THE
APPLICABILITY OF THE METHOD OF ANALYSIS FOR FURTHER
INVESTIGATION OF RESONATORS FOR MODE-LOCKED LASERS.
ALSO THE POTENTIAL OF MODE-LOCKED LASERS FOR USE IN
A HIGH-BIT RATE COMMUNICATIONS SYSTEM IS
INVESTIGATED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-728 743 20/6
RAND CORP SANTA MONICA CALIF

PROPAGATION OF A FOCUSED LASER BEAM IN A
TURBULENT ATMOSPHERE,

(U)

JUN 71 33P LUTOMIRSKI, R. F. ;
REPT. NO. R-608-ARPA
CONTRACT: DAHC15-67-C-0141, ARPA ORDER-189-1

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-707 861.

DESCRIPTORS: (*COHERENT RADIATION, FOCUSING),
(*LIGHT TRANSMISSION, ATMOSPHERIC MOTION), LIGHT
COMMUNICATION SYSTEMS, RANGE FINDING, TARGET
ACQUISITION, REFRACTIVE INDEX, GAS LASERS,
IRASERS

(U)

IDENTIFIERS: CARBON DIODIDE LASERS, LASER
BEAMS

(J)

A METHOD IS GIVEN FOR CALCULATING THE PERFORMANCE
OF A LASER SYSTEM WITH BEAM TRUNCATED BY FOCUSING
OPTICS IN A TURBULENT ATMOSPHERE. PREVIOUS
ANALYSES HAVE BEEN LIMITED TO VACUUM CALCULATIONS
WITH UNTRUNCATED BEAMS, AND EVEN THEN HAVE NOT
CONSERVED THE IRRADIANCE. THIS APPROACH SEPARATES
THE GEOMETRY OF THE PROBLEM (THE COMPLEX APERTURE
DISTRIBUTION) FROM THE BEAM PROPAGATION.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-729 263 20/5
NORTHROP CORPORATE LABS HAWTHORNE CALIF

CO2 LASER PULSING TECHNIQUES. (U)

DESCRIPTIVE NOTE: SEMIANNUAL REPT. DEC 69-DEC 71,
AUG 71 35P MANN, M. M. ;
REPT. NO. NCL-71-41R
CONTRACT: N00014-70-C-0185, ARPA ORDER-306

UNCLASSIFIED REPORT

DESCRIPTORS: (*GAS LASERS, LIGHT PULSES),
(*COHERENT RADIATION, MODULATION),
ELECTROOPTICS, AMPLITUDE MODULATION, FREQUENCY
MODULATION, GALLIUM ARSENIDES, LIGHT COMMUNICATION
SYSTEMS, RANGE FINDING (U)
IDENTIFIERS: *CARBON DIOXIDE LASERS, MODE LOCKED
LASERS (U)

IN A STUDY OF CO2 LASER PULSING TECHNIQUES,
MODE-LOCKING AND PULSE COUPLING OF A CO2 LASER
USING A SINGLE ELECTROOPTIC ELEMENT HAVE BEEN
DEMONSTRATED. DATA ON THE EFFECT OF MODULATOR
DETUNING AND COUPLING FACTOR VARIATION ARE PRESENTED.
THE PRELIMINARY RESULTS OF AN INVESTIGATION OF
ELECTROOPTIC TECHNIQUES FOR AM AND FM LOCKING OF
TEA LASERS ARE GIVEN. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-729 334 20/5
ARMY MISSILE COMMAND REDSTONE ARSENAL ALA PHYSICAL
SCIENCES DIRECTORATE

CO2 LASER PULSING,

(U)

JUL 71 112P PARDUE, ALBERT L. , JR;
REPT. NO. RR-TR-71-8
PROJ: DA-1-T-262303-A-308

UNCLASSIFIED REPORT

DESCRIPTORS: (*GAS LASERS, LIGHT PULSES), PULSE
MODULATION, COHERENT RADIATION, WAVE FUNCTIONS,
IRASERS

(U)

IDENTIFIERS: *CARBON DIOXIDE LASERS, Q SWITCHED
LASERS, MODE LOCKED LASERS, LASER BEAMS, WAVE
EQUATIONS

(U)

A THEORETICAL AND EXPERIMENTAL ANALYSIS OF LASER
MODE COUPLING AND REACTIVE Q-SWITCHING HAS BEEN
PRESENTED. IN THE FORCED MODE LOCKING SITUATION,
THE TOTAL CAVITY ELECTROMAGNETIC FIELD INTENSITY
 $E(Z,T)$ WAS EXPRESSED AS AN EXPANSION OF QUASI-
NORMAL MODES WHICH SATISFY THE BOUNDARY CONDITIONS AT
BOTH THE FIXED AND MOVING MIRROR. SOLUTIONS OF THE
WAVE EQUATION INDICATED THAT THE MODES OF OPERATION
WERE ANALOGOUS TO THE PHASED LOCKED OSCILLATIONS OF
THE PHASE-MODULATED LASER. A PEAK MIRROR EXCURSION
OF 1400 ANGSTROMS WAS USED TO MODE LOCK A CO2
LASER. REACTIVE Q-SWITCHING WAS OBTAINED BY
MODULATION OF THE CAVITY LENGTH WITH A MOSSBAUER
TRANSDUCER. REGULAR Q-SWITCHED PULSES WERE
OBTAINED AT RATES BETWEEN 1 AND 60 KILOHERTZ.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-729 447 20/6 20/5 4/1
AIR FORCE CAMBRIDGE RESEARCH LABS L G HANSCOM FIELD
MASS

ATMOSPHERIC ATTENUATION OF CO LASER
RADIATION.

(U)

DESCRIPTIVE NOTE: ENVIRONMENTAL RESEARCH PAPERS,
JUL 71 118P MCCLATCHEY, R. A. 1
REPT. NO. AFCRL-71-0370, AFCRL-ERP-359

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT TRANSMISSION, ATMOSPHERE),
(*COHERENT RADIATION, ATTENUATION), ABSORPTION
SPECTRUM, INFRARED RADIATION, GAS LASERS, IRASERS,
TABLES

(U)

IDENTIFIERS: CARBON MONOXIDE LASERS, ATMOSPHERIC
ATTENUATION

(U)

WITH THE DEVELOPMENT OF THE CO LASER HAVING
EMISSION LINES IN THE RANGE FROM 1200/CM TO GREATER
THAN 2000/CM, IT IS OF IMPORTANCE TO ESTABLISH WHICH
OF THE MORE THAN 200 LINES CAN BE TRANSMITTED THROUGH
A VARIETY OF ATMOSPHERIC PATHS. THE SPECTRAL REGION
OF CO EMISSION SPANS A VERY IMPORTANT WATER VAPOR
ABSORPTION BAND AND, IN ADDITION, THERE IS ABSORPTION
BY CO₂, O₃, N₂O AND CH₄. ABSORPTION LINES
ASSOCIATED WITH ALL OF THESE MOLECULES WERE INCLUDED
IN THE CALCULATION OF SYNTHETIC SPECTRA COVERING THE
REGION OF CO EMISSION. AFTER LIMITING THE NUMBER
OF CO EMISSION LINES TO BE CONSIDERED IN DETAIL
ACCORDING TO A CRITERION BASED ON ATMOSPHERIC
ATTENUATION, A SERIES OF TABLES WAS CONSTRUCTED
PROVIDING QUANTITATIVE ATTENUATION INFORMATION FOR
EACH OF 88 LASER LINES AND FOR 10 DIFFERENT
ATMOSPHERIC MODELS. DATA BASED ON TWO DIFFERENT
AEROSOL SCATTERING MODELS ARE INCLUDED IN THESE
TABLES. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-729 888 20/5
INFORMATICS TISCO INC RIVERDALE MD

BIBLIOGRAPHY OF SOVIET LASER
DEVELOPMENTS.

(U)

DESCRIPTIVE NOTE: INTERIM REPT. JAN 69-JUN 70,
JAN 71 202P ALLEN, LIDA L. ;
CONTRACT: F44620-70-C-0081, ARPA ORDER-1622
MONITOR: AFOSR TR-71-0947

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO INTERIM REPT. NO. 3, AD-
726 139.

DESCRIPTORS: (*LASERS, USSR), (*BIBLIOGRAPHIES,
LASERS), SCIENTIFIC RESEARCH, GAS LASERS,
IRASERS, SEMICONDUCTORS, DYES, COHERENT
RADIATION, OPTICAL EQUIPMENT COMPONENTS, LIGHT
COMMUNICATION SYSTEMS, STEREOSCOPIC PHOTOGRAPHY,
PLASMA GENERATORS

(U)

IDENTIFIERS: QUANTUM ELECTRONICS, SOLID STATE
LASERS, SEMICONDUCTOR LASERS, INJECTION LASERS,
LIQUID LASERS, CHEMICAL LASERS, ULTRAVIOLET
LASERS, HOLOGRAPHY, LASER MATERIALS, NONLINEAR
OPTICS, SECOND HARMONIC GENERATION

(U)

THE BIBLIOGRAPHY OF SOVIET PUBLICATIONS ON LASERS
COVERS THE PERIOD 1969-1970. APPROXIMATELY 1500
ARTICLES ARE CITED. THIS OUTPUT IS CLEAR EVIDENCE
OF INCREASED ATTENTION TO ADVANCED DEVELOPMENT IN
SUCH AREAS AS HOLOGRAPHY, BEAM-TARGET INTERACTIONS,
HIGH-TEMPERATURE PLASMA GENERATION AND CHEMICAL
LASERS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-730 438 20/12 20/6
NAVAL RESEARCH LAB WASHINGTON D C

OPTICAL WAVEGUIDES AND INTEGRATED OPTICS
TECHNOLOGY.

(U)

DESCRIPTIVE NOTE: INTERIM REPT.,
AUG 71 34P ANDREWS, R. A. ;
REPT. NO. NRL-7291
PROJ: RR002-07-41-5064, NRL-N01-12

UNCLASSIFIED REPORT

DESCRIPTORS: (*SEMICONDUCTING FILMS,
*ELECTROOPTICS), (*WAVEGUIDES, ELECTROOPTICS),
LASERS, DIELECTRICS, FIBER OPTICS, MODULATORS,
GALLIUM ARSENIDES, OPTICAL EQUIPMENT COMPONENTS,
DETECTORS, LIGHT COMMUNICATION SYSTEMS, COMPUTERS,
LOGIC CIRCUITS, DISPLAY SYSTEMS
IDENTIFIERS: NONLINEAR OPTICS, QUANTUM
ELECTRONICS, *OPTICAL WAVEGUIDES, SEMICONDUCTOR
LASERS, THIN FILMS

(U)

(U)

AN INTRODUCTION IS GIVEN TO THE OPTICAL WAVEGUIDE
AND INTEGRATED OPTICS TECHNOLOGY WITH EMPHASIS ON
POTENTIAL APPLICATION IN NAVY SYSTEMS. THE
FUNDAMENTALS OF OPTICAL WAVEGUIDES ARE PRESENTED, AS
WELL AS A DISCUSSION OF THEIR IMPORTANT
CHARACTERISTICS. A DESCRIPTION OF ALL THE
WAVEGUIDE PASSIVE AND ACTIVE DEVICES THAT HAVE BEEN
DEMONSTRATED IS GIVEN. AREAS WHERE NEW DEVICES ARE
POSSIBLE ARE ALSO DISCUSSED. THIS DISCUSSION
INCLUDES OPTICAL WAVEGUIDES, PASSIVE OPTICAL
ELEMENTS, COUPLERS, LASERS AND AMPLIFIERS,
MODULATORS, DEFLECTORS, DETECTORS, NONLINEAR DEVICES,
AND INPUT AND OUTPUT COUPLERS. THE APPLICATION OF
THESE DEVICES TO INTEGRATED OPTICAL SYSTEMS FOR
COMMUNICATIONS, DISPLAY, AND COMPUTERS IS DISCUSSED.
CONCLUSIONS ARE DRAWN ABOUT THE FUTURE GROWTH OF
THIS TECHNOLOGY IN LIGHT OF THE CURRENT POTENTIAL AND
THE IMPORTANT PROBLEM AREAS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-731 109 20/2 20/5
AIR FORCE CAMBRIDGE RESEARCH LABS L G HANSCOM FIELD
MASS

PREPARATION AND PROPERTIES OF CUPROUS IODIDE,

(U)

JUN 71 7P O'CONNOR, JOHN J. ;
ARMINGTON, ALTON F. ;
REPT. NO. AFCRL-71-0478
PROJ: AF-5620
TASK: 562009

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN MATERIALS RESEARCH
BULLETIN, V6 P765-770 1971.
SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 9 JUN
71.

DESCRIPTORS: (*IODIDES, *CRYSTAL GROWTH), COPPER
COMPOUNDS, HYDROLYSIS, MODULATORS, LASERS, X-RAY
DIFFRACTION ANALYSIS

(U)

IDENTIFIERS: *COPPER IODIDES, *LASER MODULATORS,
LASER MATERIALS

(U)

CUPROUS IODIDE, A POTENTIAL LASER MODULATOR
MATERIAL, HAS BEEN GROWN FROM HYDRIODIC ACID SOLUTION
BY THE SLOW DECOMPOSITION OF THE CUI:HI COMPLEX.
EMISSION SPECTROGRAPHIC ANALYSIS DEMONSTRATED THAT
THE CRYSTALS PRODUCED ARE CONSIDERABLY PURER THAN THE
STARTING MATERIAL. A LAUE PATTERN INDICATES A
HIGH DEGREE OF CRYSTAL PERFECTION. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-731 242 20/5
INFORMATICS TISCO INC RIVERDALE MD

BIBLIOGRAPHY OF SOVIET LASER
DEVELOPMENTS.

(U)

DESCRIPTIVE NOTE: REPT. NO. 2, JUL-DEC 70,
JUL 71 146P HIBBEN, STUART G. J
CONTRACT: F44620-70-C-0081, ARPA ORDER-1622
MONITOR: AFOSR TR-71-2653

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO REPORT DATED 14 JAN 71,
AD-729 888.

DESCRIPTORS: (*LASERS, USSR), (*BIBLIOGRAPHIES,
LASERS), SCIENTIFIC RESEARCH, GAS LASERS,
IRASERS, SEMICONDUCTORS, DYES, COHERENT
RADIATION, OPTICAL EQUIPMENT COMPONENTS, RADIATION
DAMAGE, RADIATION EFFECTS, LIGHT COMMUNICATION
SYSTEMS, STEREOSCOPIC PHOTOGRAPHY, PLASMA
GENERATORS, STANDARDS

(U)

IDENTIFIERS: QUANTUM ELECTRONICS, SOLID STATE
LASERS, SEMICONDUCTOR LASERS, LIQUID LASERS,
CHEMICAL LASERS, ULTRAVIOLET LASERS, LASER
MATERIALS, NONLINEAR OPTICS, HOLOGRAPHY

(U)

THIS IS THE SECOND ISSUE INTENDED TO GIVE A
COMPREHENSIVE LISTING OF SOVIET PUBLICATIONS IN
LASER TECHNOLOGY FOR 1969-1970, AND COMPLEMENTS THE
FIRST ISSUE BY COVERING ALL THE NON-PERIODIC
LITERATURE FOR THIS INTERVAL. THIS INCLUDES OVER
100 SOURCES COMPRISING INSTITUTIONAL TRANSACTIONS,
COLLECTIONS OF ARTICLES, CONFERENCE PROCEEDINGS, AND
MONOGRAPHS DEALING WITH LASER DEVELOPMENTS. ALSO
INCLUDED IS MATERIAL FROM REGULAR PERIODICALS FOR
JULY THROUGH DECEMBER, 1970. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-731 535 17/2
MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB
TOPICS IN MILLIMETER-WAVE AND OPTICAL SPACE
COMMUNICATION. (U)

DESCRIPTIVE NOTE: TECHNICAL NOTE,
SEP 71 38P WARD, WILLIAM W. ; ZOLNAY,
STEPHEN L. ;
REPT. NO. TN-1971-43
CONTRACT: F19628-70-C-0230
PROJ: AF-649L
MONITOR: ESD TR-71-269

UNCLASSIFIED REPORT

DESCRIPTORS: (*SPACE COMMUNICATION SYSTEMS,
MILLIMETER WAVES), (*LIGHT COMMUNICATION SYSTEMS,
SPACE COMMUNICATION SYSTEMS), LASERS,
ATTENUATION, PERFORMANCE (ENGINEERING),
RELIABILITY (U)
IDENTIFIERS: FREQUENCY ALLOCATION, YAG LASERS,
NEODYMIUM LASERS, CARBON DIOXIDE LASERS (U)

MANY COMPARATIVE STUDIES HAVE BEEN MADE OF
MILLIMETER-WAVE AND OPTICAL SPACE-COMMUNICATION
SYSTEMS. THE APPLICATIONS CONSIDERED HAVE BEEN
DIVERSE, INCLUDING LINKS BETWEEN SATELLITES IN LOW
EARTH ORBITS, SATELLITES IN SYNCHRONOUS ORBITS,
DEEP-SPACE PROBES, AND EARTH TERMINALS, WITH DATA-
RATE REQUIREMENTS FROM A FEW BIT/SEC TO GBIT/SEC.
THIS REPORT PRESENTS A SHORT TUTORIAL ACCOUNT OF
THE COMMON AND OF THE DISTINCTLY DIFFERENT FEATURES
OF SOME MILLIMETER-WAVE AND OPTICAL SPACE-
COMMUNICATION SYSTEMS. FOR EXAMPLE, THE DESIGN OF
THE TRANSMITTING ANTENNAS IS GOVERNED BY THE SAME
ELECTROMAGNETIC THEORY, WHICH ACCOUNTS FOR
DIFFRACTION AT AN APERTURE. HOWEVER, THE SIGNAL-TO-
NOISE RELATIONSHIPS IN THE RECEIVERS MAY NOT BE THE
SAME (GAUSSIAN VS POISSON NOISE STATISTICS).
POSSIBLE SATELLITE APPLICATIONS ARE SURVEYED
BRIEFLY, WITH MENTION OF THE FAVORABLE AND THE
UNFAVORABLE FACTORS ASSOCIATED WITH MILLIMETER-WAVE
AND OPTICAL SPACE-COMMUNICATION SYSTEMS. CANDIDATE
SYSTEMS ARE POSTULATED AND LINK CALCULATIONS ARE
GIVEN. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-732 109 20/5
STANFORD UNIV CALIF MICROWAVE LAB

MODULATOR FREQUENCY DETUNING EFFECTS IN THE
FM MODE-LOCKED LASER,

(U)

JUL 70 7P SIEGMAN, A. E. ; KUIZENGA,
DIRK J. ;
CONTRACT: F44620-69-C-0017
PROJ: AF-9767
TASK: 976702
MONITOR: AFOSR TR-2830

UNCLASSIFIED REPORT

AVAILABILITY: PUB. IN IEEE JNL. OF QUANTUM
ELECTRONICS, VQE6 N12 P803-808 DEC 70.

SUPPLEMENTARY NOTE: REVISION OF REPORT DATED 4 MAY
70.

DESCRIPTORS: (*LASERS, FREQUENCY MODULATION),
COHERENT RADIATION, PHASE SHIFT, GAIN, INTEGRAL
TRANSFORMS

(U)

IDENTIFIERS: MODE LOCKED LASERS, QUANTUM
ELECTRONICS, YAG LASERS, NEODYMIUM LASERS

(U)

THE MODE-LOCKING BEHAVIOR OF A HOMOGENEOUS LASER
WITH AN INTRACAVITY FM MODULATOR CHANGES RAPIDLY
AND ASYMMETRICALLY WHEN THE MODULATION FREQUENCY IS
DETUNED BY SMALL AMOUNTS FROM ITS OPTIMUM VALUE. A
SIMPLE ANALYSIS OF THESE DETUNING EFFECTS IS
DEVELOPED. THE ANALYSIS GIVES EXPLICIT EXPRESSIONS
FOR ALL ASPECTS OF THE MODE-LOCKING BEHAVIOR AS
FUNCTIONS OF DETUNING. A PHYSICAL INTERPRETATION OF
THE ANALYSIS ALSO MAKES CLEAR WHICH PHYSICAL
MECHANISMS ARE RESPONSIBLE FOR THE DETUNING BEHAVIOR.
(AUTHOR)

(U)

UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-732 146 20/5

POLYTECHNIC INST OF BROOKLYN FARMINGDALE N Y DEPT OF
ELECTROPHYSICS

PASSIVE Q-SWITCHING AND MODE LOCKING OF A
CO₂ LASER WITH CH₃BR, PF₅, OR SF₆ AND
SELF-MODE LOCKING USING ELECTRICAL PULSE
EXCITATION.

(U)

APR 71 3P JUNG, C. K. ; RONN, A. M. ;
LATOURRETTE, J. T. ;
CONTRACT: F44620-69-C-0047
PROJ: AF-4751
MONITOR: AFOSR TR-71-2839

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN JNL. OF APPLIED PHYSICS,
V41 N10 P4240-4242 SEP 70.

DESCRIPTORS: (*GAS LASERS, OPERATION), LIGHT
PULSES, MODULATION, GAIN, BROMIDES, FLUORIDES,
SULFUR COMPOUNDS, PHOSPHORUS COMPOUNDS, METHANE,
IRASERS

(U)

IDENTIFIERS: *CARBON DIOXIDE LASERS, *MODE LOCKED
LASERS, *Q SWITCHED LASERS, METHANE/BROMO,
PHOSPHORUS FLUORIDES, SULFUR HEXAFLUORIDE

(U)

RESULTS ARE GIVEN OF EXPERIMENTAL STUDIES USING THE
GASES CH₃BR, PF₅, SF₆ AND CO₂ WITH ADDED
BUFFER GASES HE AND H₂ AS SATURABLE ABSORBERS IN
Q-SWITCHING AND MODE LOCKING OF A CO₂ LASER,
INCLUDING SELF MODE LOCKING OBTAINED BY ELECTRICAL
PULSE EXCITING OF HALF OF THE DISCHARGE TUBE.
(AUTHOR)

(U)

UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-732 229 20/5

RAYTHEON CO WALTHAM MASS SPECIAL MICROWAVE DEVICES
OPERATION

DEVELOPMENT AND FABRICATION OF A YAG LASER
SYSTEM FOR STUDY OF MODE LOCKING AND PULSE
CODING LASER OUTPUT.

(U)

DESCRIPTIVE NOTE: FINAL REPT. 1 JAN-1 JUL -1,
JUL 71 19P WARGO, LORAND J. ;

REPT. NO. SM-279

CONTRACT: F19623-71-C-0053

PROJ: ILIR-9-70

TASK: ILIR-9-70-01

MONITOR: AFCL 71-0471

UNCLASSIFIED REPORT

DESCRIPTORS: (*LASERS, YTTRIUM COMPOUNDS),
SYSTEMS ENGINEERING, PULSE CODE MODULATION, LIGHT
PULSES, ALUMINATES, GARNET, MODULATORS,
PUMPING(OPTICAL)

(U)

IDENTIFIERS: *YAG LASERS, NEODYMIUM LASERS, MODE
LOCKED LASERS, Q SWITCHED LASERS

(U)

A SPECIAL PURPOSE, HIGH REPETITION RATE ND:YAG
LASER SYSTEM HAS BEEN DESIGNED, DEVELOPED AND
FABRICATED FOR USE IN EXPERIMENTS IN MODE LOCKING AND
PULSE CODING. THE SYSTEM CONSISTS OF A LASER
TRANSMITTER, POWER SUPPLY AND COOLER. THE
TRANSMITTER IS A MECHANICALLY STABILIZED, 1 METER
LONG OPTICAL CAVITY WITH A FLASH-PUMPED SINGLE CAVITY
OSCILLATOR USING A 1/4 IN. X 2 IN. ND:YAG
CRYSTAL, A KD CALITA PRIME P POCKELS CELL, AND
A 150 MHZ MODE-LOCKING MODULATOR CELL. THE SYSTEM
WAS SUCCESSFULLY TESTED UP TO A REPETITION RATE OF 50
PPS AND A 100 NANOSECOND Q-SWITCHED OUTPUT OF 130
MILLIJOULES. MODE-LOCKED PULSES WERE MEASURED AT
0.8 NANOSECONDS. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-732 244 20/5
INFORMATICS TISCO INC RIVERDALE MD

BIBLIOGRAPHY OF SOVIET LASER
DEVELOPMENTS.

(U)

DESCRIPTIVE NOTE: INTERIM REPT. NO. 4, APR-JUN 71,
AUG 71 100P HIBBEN, STUART G. ;
CONTRACT: F44620-70-C-0081, ARPA ORDER-1622
PROJ: ARPA-OF10
MONITOR: AFOSR TR-71-2814

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO AD-726 139.

DESCRIPTORS: (*LASERS, USSR), (*BIBLIOGRAPHIES,
LASERS), GAS LASERS, IRASERS, SEMICONDUCTORS,
OPTICAL MATERIALS, OPTICAL EQUIPMENT COMPONENTS,
COHERENT RADIATION, CRYSTAL GROWTH, DATA
PROCESSING SYSTEMS, LIGHT COMMUNICATION SYSTEMS,
STEREOSCOPIC PHOTOGRAPHY, PLASMA GENERATORS (U)
IDENTIFIERS: SOLID STATE LASERS, SEMICONDUCTOR
LASERS, LIQUID LASERS, CHEMICAL LASERS,
ULTRAVIOLET LASERS, NONLINEAR OPTICS, ORGANIC
DYE LASERS, LASER MATERIALS, QUANTUM ELECTRONICS,
SECOND HARMONIC GENERATION, HOLOGRAPHY (U)

THE REPORT COVERS THE SECOND QUARTER OF 1971 WITH
THE MAJOR YIELD OF INFORMATION COMING FROM THE
APPROXIMATELY 30 PERIODICALS KNOWN TO REPORT THE MOST
ADVANCED AND INTERESTING FINDINGS IN SOVIET LASER
TECHNOLOGY. THIS AS WELL AS THE PREVIOUS THREE
REPORTS COVERS THE FOLLOWING TOPICS: (1) LASER
RESEARCH -- SOLID STATE, LIQUID, GAS AND CHEMICAL
LASERS; UV; COMPONENTS; NONLINEAR OPTICS;
SPECTROSCOPY OF LASER MATERIALS; SHORT PULSE
GENERATION; CRYSTAL GROWING; AND GENERAL THEORY;
(2) LASER APPLICATIONS -- BIOLOGICAL EFFECTS,
COMMUNICATION, COMPUTER TECHNOLOGY, HOLOGRAPHY,
INSTRUMENTATION, MATERIALS PROCESSING, AND PLASMA
GENERATION. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-733 252 20/6 20/5
HUGHES AIRCRAFT CO CULVER CITY CALIF ELECTRONIC PROPERTIES
INFORMATION CENTER

THE ELECTRO-OPTIC EFFECT AND PROPERTIES OF
GALLIUM ARSENIDE FOR MODULATION
APPLICATIONS.

(U)

DESCRIPTIVE NOTE: INTERIM REPT.,
NOV 70 11P MILEK, JOHN T. ;
REPT. NO. EPIC-IR-77

UNCLASSIFIED REPORT

DESCRIPTORS: (*GALLIUM ARSENIDES, ELECTROOPTICS),
(*COHERENT RADIATION, MODULATORS),
SEMICONDUCTORS, GAS LASERS, IRASERS, MODULATION,
INFRARED RADIATION (U)
IDENTIFIERS: LASER MODULATORS, CARBON DIOXIDE
LASERS, SECOND HARMONIC GENERATION (U)

THE ADVENT OF THE CO2 LASER HAS GENERATED THE
NEED FOR A 10.6-MICRON INFRARED MODULATOR. GALLIUM
ARSENIDE APPEARS TO BE A VERY SUITABLE MATERIAL FOR
INFRARED MODULATION AND HAS BEEN WIDELY EXPLORED AS
EVIDENT BY 66 REFERENCES LISTED IN THE BIBLIOGRAPHY
PROVIDED BY THIS INTERIM REPORT. (AUTHOR) (U)

UNCLASSIFIED

ODC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-734 046 9/2 18/3
VISIDYNE INC WOBURN MASS

OPTIR II.

(U)

DESCRIPTIVE NOTE: SPECIAL SCIENTIFIC REPT. ON VOLUME 1,
SEP 71 190P MANLEY, OSCAR P. ; SMITH,
HENRY J. P. ; TREVE, YVAIN M. ; CARPENTER, JACK
W. ; DEGGES, THOMAS C. ;
REPT. NO. VI-52-1
CONTRACT: F19628-70-C-0097
PROJ: AF-5710
MONITOR: AFCRL 71-0528(I)

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO SPECIAL SCIENTIFIC REPT. ON
VOLUME 2, AD-734 047.

DESCRIPTORS: (*COMPUTER PROGRAMS, INSTRUCTION
MANUALS), (*NUCLEAR EXPLOSIONS, INFRARED
RADIATION), (*EXPLOSION EFFECTS, LIGHT),
AIRBURST, NUCLEAR RADIATION, MATHEMATICAL MODELS,
OPTICAL EQUIPMENT, RADIATION DAMAGE, ULTRAVIOLET
RADIATION, CHEMILUMINESCENCE, OPTICAL TRACKING,
LIGHT HOMING, LIGHT COMMUNICATION SYSTEMS
IDENTIFIERS: OPTIR 2 COMPUTER CODE

(U)

(U)

THE REPORT DOCUMENTS THE SECOND GENERATION VERSION
OF THE OPTIR CODE - OPTIR II. THE EFFORT IS
AIMED AT ESTABLISHING THE BASIC PHYSICAL PRINCIPLES
UNDERLYING THE WIDESPREAD, LONG TERM OPTICAL/INFRARED
RADIATION OBSERVED FOLLOWING ATMOSPHERIC NUCLEAR
DETONATIONS. THE RESULTS OF SUCH STUDIES ARE
CRUCIAL TO THE DESIGN AND EVALUATION OF OPTICAL
SURVEILLANCE, DETECTION, DISCRIMINATION, TRACKING AND
HOMING SYSTEMS AND FUTURE LASER COMMUNICATION
SYSTEMS, ALL OF WHICH MUST BE ABLE TO FUNCTION IN A
NUCLEAR ENVIRONMENT.

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-734 047 9/2 18/3
VISIDYNE INC WOBURN MASS

OPTIR II.

(U)

DESCRIPTIVE NOTE: SPECIAL SCIENTIFIC REPT. ON VOLUME 2,
SEP 71 174P MANLEY, OSCAR P. ; SMITH,
HENRY J. P. ; TREVE, YVAIN M. ; CARPENTER, JACK
W. ; DEGGS, THOMAS C. ;
REPT. NO. VI-52-2
CONTRACT: F19628-70-C-0097
PROJ: AF-5710
MONITOR: AFCRL 71-0528(II)

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO SPECIAL SCIENTIFIC REPT. ON
VOLUME 3, AD-734 048.

DESCRIPTORS: (*COMPUTER PROGRAMS, INSTRUCTION
MANUALS), (*NUCLEAR EXPLOSIONS, INFRARED
RADIATION), (*EXPLOSION EFFECTS, LIGHT),
AIRBURST, NUCLEAR RADIATION, GAMMA RAYS, X RAYS,
RADIATION DAMAGE, ATTENUATION, INTEGRAL EQUATIONS,
COMPTON SCATTERING, ULTRAVIOLET RADIATION,
PHOTOCHEMISTRY, ELECTRON DENSITY, IONIZATION,
THERMAL RADIATION, MATHEMATICAL MODELS (U)
IDENTIFIERS: OPTIR 2 COMPUTER CODE (U)

THE REPORT, VOLUME 2, DESCRIBING THE OPTIR 2
COMPUTER CODE IS AN EXTENSION OF VOLUME 1
PERTAINING TO VARIOUS MODELS OF THE RADIATION EFFECTS
OF NUCLEAR EXPLOSIONS. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-734 048 9/2 18/3
VISIDYNE INC WOBURN MASS

OPTIR II.

(U)

DESCRIPTIVE NOTE: SPECIAL SCIENTIFIC REPT. ON VOLUME 3,
SEP 71 136P MANLEY, OSCAR P. ; SMITH,
HENRY J. P. ; TREVE, YVAIN M. ; CARPENTER, JACK
W. ; DEGGES, THOMAS C. ;
REPT. NO. VI-52-3
CONTRACT: F19628-70-C-0097
PROJ: AF-5710
MONITOR: AFCRL 71-0528(III)

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO SPECIAL SCIENTIFIC REPT. ON
VOLUME 2.

DESCRIPTORS: (*COMPUTER PROGRAMS, NUCLEAR
EXPLOSIONS), (*NUCLEAR EXPLOSIONS, EXPLOSION
EFFECTS), AIRBURST, LOW ALTITUDE, NUCLEAR
RADIATION, CHEMILUMINESCENCE, RAYLEIGH SCATTERING,
AIRGLOW, DIFFERENTIAL EQUATIONS (U)
IDENTIFIERS: OPTIR 2 COMPUTER CODE, PHOTOCHEMICAL
REACTIONS, FORTRAN, RKM COMPUTER CODE (U)

THE REPORT, VOLUME 3 OF THE OPTIR 2 COMPUTER
CODE DESCRIBES VARIOUS MODELS EMPLOYED IN THE CODE. (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-734 417 20'5
NORTHROP CORP HAWTHORNE CALIF LASER SYSTEMS DEPT
CO LASER LINE SELECTION TECHNIQUE. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. 1 AUG 70-15 DEC 71,
DEC 71 40P BHAUMIK, MANI L. ?
REPT. NO. NLSO-71-7R
CONTRACT: N00014-71-C-0037, N00014-72-C-0043
PROJ: NR-016-303

UNCLASSIFIED REPORT

DESCRIPTORS: (*GAS LASERS, LINE SPECTRUM),
POWER, ABSORPTION SPECTRUM, MOLECULAR
SPECTROSCOPY, IRASERS, LIGHT TRANSMISSION,
ATMOSPHERE (U)
IDENTIFIERS: *CARBON MONOXIDE LASERS, VIBRATIONAL
SPECTRA, ROTATIONAL SPECTRA, ATMOSPHERIC
ATTENUATION (U)

AN INTRACAVITY GAS CELL TECHNIQUE IS DEMONSTRATED
FOR RESTRICTING THE CARBON MONOXIDE (CO) LASER
OSCILLATIONS TO LINES COINCIDENT WITH THE
TRANSMISSION BANDS OF THE ATMOSPHERE. USING AN
INTRACAVITY WATER VAPOR CELL, THE CO LASER GAIN WAS
SPOILED IN LINES THAT ARE ABSORBED BY ATMOSPHERIC
WATER VAPOR, PERMITTING THE OSCILLATIONS TO BUILD UP
ONLY ON THE HIGHER TRANSMISSION LINES. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-734 547 20/6 20/5 4/1
OHIO STATE UNIV COLUMBUS ELECTROSCIENCE LAB

INVESTIGATION OF LASER PROPAGATION
PHENOMENA.

(U)

DESCRIPTIVE NOTE: INTERIM TECHNICAL REPT. 1 JAN-1 JUL
71,

AUG 71 49P COLLINS, STUART A. , JR. I
REINHARDT, G. W. ;
REPT. NO. ESL-3163-2
CONTRACT: F30602-71-C-0132, ARPA ORDER-1279
PROJ: ARPA-1E20
MONITOR: RADC TR-71-248

UNCLASSIFIED REPORT

DESCRIPTORS: (*COHERENT RADIATION, ATMOSPHERIC
MOTION), LIGHT TRANSMISSION, PROPAGATION,
TURBULENCE, MICROMETEOROLOGY
IDENTIFIERS: LASER BEAMS

(U)

(U)

THIS REPORT DEALS WITH THEORETICAL INVESTIGATIONS
IN THE AREA OF LINEAR ATMOSPHERIC PROPAGATION
PHENOMENA AND MICROTURBULENCE STATISTICS. IT
SPECIFICALLY DEALS WITH THE EXAMINATION OF PROPER
AVERAGING TIMES REQUIRED FOR PROPAGATION EXPERIMENTS
AND WITH THEORETICAL BACKUP FOR PHASE STRUCTURE
FUNCTION MEASUREMENTS. FINALLY, A BIBLIOGRAPHY ON
OPTICAL PROPAGATION WHICH WAS PREPARED EARLIER HAS
BEEN UPDATED. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-734 798 20/6 20/5
RCA LABS PRINCETON N J

EFFECTS OF TURBULENCE INSTABILITIES ON LASER
PROPAGATION.

(U)

DESCRIPTIVE NOTE: QUARTERLY PROGRESS REPT. NO. 1, 9 JUN-
8 SEP 71,

OCT 71 26P DE WOLF, DAVID A. ;
REPT. NO. PRRL-71-CR-31
CONTRACT: F30602-71-C-0356, ARPA ORDER-1279
PROJ: ARPA-1E20
MONITOR: RADC TR-71-249

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT TRANSMISSION, ATMOSPHERIC
MOTION), (*COHERENT RADIATION, FOCUSING),
TURBULENCE, OPTICAL IMAGES, DISTORTION
IDENTIFIERS: *LASER BEAMS, ATMOSPHERIC
ATTENUATION

(U)

(U)

WHEN IMAGES ARE FORMED FROM LASER BEAMS PROPAGATING
THROUGH TURBULENT AIR, A VARIETY OF SCINTILLATION
PHENOMENA OCCURS: BEAM WANDER, INTENSITY
FLUCTUATIONS, HOT- AND COLD-SPOT FORMATION, IMAGE
BLURRING, SPOT BROADENING, ETC. THE PURPOSE OF
THIS PROJECT IS TO STUDY THESE EFFECTS ANALYTICALLY,
AND THUS TO INTERPRET MEASUREMENTS AND PREDICT
PERFORMANCE IN FUTURE LASER SYSTEMS.
(AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-735 935 20/6 20/5
OREGON GRADUATE CENTER BEAVERTON*

MULTIWAVELENGTH LASER PROPAGATION STUDY. (U)

DESCRIPTIVE NOTE: SEMIANNUAL REPT. JUL-DEC 71,
JAN 72 87P KERR, J. RICHARD ;
REPT. NO. 1154-13
CONTRACT: N00014-68-A-0461-0001, ARPA ORDER-1806

UNCLASSIFIED REPORT

DESCRIPTORS: (*COHERENT RADIATION, ATMOSPHERIC
MOTION), (*LASERS, LIGHT TRANSMISSION),
SCINTILLATION, TURBULENCE, SCATTERING,
DISTRIBUTION FUNCTIONS, INFRARED RADIATION,
IRASERS, LIGHT COMMUNICATION SYSTEMS (U)
IDENTIFIERS: ATMOSPHERIC SCATTERING, *LASER
BEAMS (U)

DURING THE REPORTING PERIOD, PRELIMINARY
EXPERIMENTS WERE CONDUCTED ON THE NATURE AND EFFECTS
OF FUNDAMENTAL INTERMITTENCIES IN ATMOSPHERIC
TURBULENCE. THESE INTERMITTENCIES AFFECT
SCINTILLATION LEVELS, STATISTICS, AND EXPERIMENTAL
DATA SPREAD, TO A MUCH GREATER DEGREE THAN HAS BEEN
GENERALLY RECOGNIZED. FOLLOWING THIS, ATTENTION WAS
GIVEN TO TRANSMITTER APERTURE EFFECTS, AND CURRENT
EXPERIMENTS ARE POINTING OUT SERIOUS DEFICIENCIES IN
CERTAIN THEORETICAL PREDICTIONS. AS AN EXAMPLE,
THE CONCEPT OF A FOCUSED BEAM SEEMS LARGELY
MEANINGLESS IN TURBULENCE, AND PREDICTIONS OF SHARP
REDUCTIONS IN SCINTILLATIONS UNDER SUCH A CONDITION
ARE NOT BORNE OUT BY PHOTOGRAPHIC AND ELECTRONIC
OBSERVATIONS. FINALLY, A RECENT SERIES OF
COMPREHENSIVE MULTIWAVELENGTH SCINTILLATION
EXPERIMENTS WAS INCORPORATED INTO A PAPER, WITH THE
ADDITION OF NEW INTERPRETATIVE MATERIAL.
(AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-736 037 20/5 4/1
OHIO STATE UNIV COLUMBUS ELECTROSCIENCE LAB

LASER ABSORPTION IN THE 5 MICRON BAND. (U)

DESCRIPTIVE NOTE: QUARTERLY TECHNICAL REPT. 23 JUN-20
SEP 71,

NOV 71 42P LONG, RONALD ;
REPT. NO. ESL-3271-1
CONTRACT: F30602-72-C-0015, ARPA ORDER-1279
PROJ: ARPA-OE20
MONITOR: RADC TR-71-314

UNCLASSIFIED REPORT

DESCRIPTORS: (*COHERENT RADIATION, ATMOSPHERE),
ABSORPTION SPECTRUM, ATTENUATION, GAS LASERS,
CARBON MONOXIDE, ATMOSPHERIC TEMPERATURE,
HUMIDITY, OPTICAL PROPERTIES, EXPERIMENTAL DESIGN,
TEST EQUIPMENT, IRASERS (U)
IDENTIFIERS: CARBON MONOXIDE LASERS, *ATMOSPHERIC
ATTENUATION, *LASER BEAMS, INTERMEDIATE INFRARED
RADIATION, COMPUTER AIDED ANALYSIS (U)

THE REPORT SUMMARIZED TECHNICAL DETAILS OF THE WORK
PERFORMED FROM JUNE 23 TO SEPTEMBER 23, 1971.
A DETAILED DISCUSSION OF WORK PERFORMED AT THE
OHIO STATE UNIV. ELECTRO-SCIENCE
LABORATORY IS PRESENTED. THIS WORK CONSISTED OF
ATMOSPHERIC TRANSMITTANCE CALCULATIONS NEAR 5
MICROMETER AND THE DESIGN OF A LABORATORY EXPERIMENT
TO DETERMINE THE TRANSMITTANCE OF CO LASER RADIATION
THROUGH SYNTHETIC ATMOSPHERES. COMPUTER PROGRAMS
HAVE BEEN WRITTEN TO CALCULATE THE MOLECULAR
ABSORPTION DUE TO ATMOSPHERIC ABSORBERS NEAR
5MICROMETER. THE TYPE OF CALCULATIONS INCLUDE
COMPUTER PLOTS OF THE CALCULATED SPECTRA, MORE
ACCURATE TRANSMITTANCE VALUES AT THE FREQUENCIES OF
THE CO LASER EMISSIONS FOR HORIZONTAL PATHS, AND
TRANSMITTANCE VALUES AT THE FREQUENCIES OF THE CO
LASER EMISSIONS FOR SLANT PATHS THROUGH THE
ATMOSPHERE. PRELIMINARY CALCULATIONS ARE PRESENTED
WITH WATER VAPOR AS THE ONLY ATMOSPHERIC ABSORBER
CONSIDERED. THE DESIGN OF AN EXPERIMENT TO MEASURE
THE TRANSMITTANCE OF THE CO LASER EMISSIONS THROUGH
SIMULATED ATMOSPHERES IS DESCRIBED. SPECIFIC TOPICS
COVERED ARE THE CO LASER, SELECTION OF THE EMISSION
LINES TO BE MEASURED, THE MULTIPLE TRAVERSAL CELL,
AND THE EXPERIMENTAL PROCEDURE. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-736 282 20/6 4/1
MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB

MULTIPLE-SCATTERING MODEL FOR LIGHT
TRANSMISSION THROUGH OPTICALLY THICK CLOUDS. (U)

DESCRIPTIVE NOTE: JOURNAL ARTICLE,
JAN 71 9P HEGGESTAD, HAROLD M. ;
REPT. NO. JA-3860
CONTRACT: F19628-70-C-0230
MONITOR: ESD TR-71-313

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN JNL. OPTICAL SOCIETY OF
AMERICA, V61 N10 P1293-1300 OCT 71.

DESCRIPTORS: (*LIGHT TRANSMISSION, *CLOUDS),
SCATTERING, MATHEMATICAL MODELS, LIGHT
COMMUNICATION SYSTEMS, DISTRIBUTION FUNCTIONS (U)
IDENTIFIERS: DIGITAL SIMULATION (U)

A LINEAR-SYSTEM MODEL HAS BEEN DEVELOPED TO PREDICT IRRADIANCE DISTRIBUTIONS OF VISIBLE LIGHT BELOW AN IDEALIZED OPTICALLY THICK ATMOSPHERIC CLOUD, WHICH IS ILLUMINATED FROM ABOVE IN AN ARBITRARY MANNER. THE MODEL OFFERS ELEGANT MATHEMATICAL SIMPLICITY AT THE EXPENSE OF SOME PRECISION. AS SUCH, IT IS APPLICABLE TO A BROAD CLASS OF PROBLEMS IN WHICH CORRECT FUNCTIONAL FORMS ARE REQUIRED, BUT LEVELS OF ACCURACY BETTER THAN A FACTOR OF 2 ARE NOT NECESSARY. OPTICAL THICKNESSES CAN RANGE FROM ABOUT 5 TO 32. ONE EXAMPLE OF A PROBLEM IN THIS CLASS, THE DESIGN OF A LASER COMMUNICATION SYSTEM TO OPERATE THROUGH CLOUDS, PROVIDED THE ORIGINAL MOTIVATION FOR DEVELOPMENT OF THE LIGHT-TRANSMISSION MODEL. THE OPTICAL EFFECTS OF THE CLOUD ARE CALCULATED BY MEANS OF A FOUR-DIMENSIONAL LINEAR SUPERPOSITION INTEGRAL, WHICH TAKES ACCOUNT OF MULTIPLE SCATTERING. TWO ILLUSTRATIONS OF THE METHOD ARE GIVEN IN DETAIL, WITH INCIDENT ILLUMINATION REPRESENTED BY A TIGHTLY COLLIMATED BEAM AND BY A SUM OF INFINITE PLANE WAVES, RESPECTIVELY. (AUTHOR) (U)

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DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-736 316 20/5 4/1
GEORGETOWN UNIV WASHINGTON D C DEPT OF PHYSICS

ATMOSPHERIC DEPOLARIZATION AND STIMULATED
BRILLOUIN SCATTERING, (U)

MAY 71 5P JORNA, SIEBE ;
CONTRACT: F44620-68-C-0017
PROJ: AF-7921
MONITOR: AFOSR TR-72-0247

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN APPLIED OPTICS, V10 N12
P2661-2664 DEC 61.
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH
CALIFORNIA, SAN DIEGO, LA JOLLA, INST. FOR
PURE AND APPLIED PHYSICAL SCIENCES.

DESCRIPTORS: (*COHERENT RADIATION, ATMOSPHERE),
LIGHT TRANSMISSION, POLARIZATION, SCATTERING,
LIGHT COMMUNICATION SYSTEMS (U)
IDENTIFIERS: *LASER BEAMS, ATMOSPHERIC SCATTERING,
*BRILLOUIN SCATTERING (U)

THE EFFECT OF ELECTROSTRICTIVELY INDUCED STIMULATED
BRILLOUIN SCATTERING ON ATMOSPHERIC DEPOLARIZATION
IS STUDIED. SOLUTIONS FOR STEADY-STATE AND
TRANSIENT CONDITIONS ARE OBTAINED. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-736 354 17/2
MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF
ELECTRONICS

VARIABLE-RATE OPTICAL COMMUNICATION THROUGH
THE TURBULENT ATMOSPHERE. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
AUG 71 102P LEVITT, BARRY K. ;
REPT. NO. TR-483
CONTRACT: DA-28-043-AMC-02536(E), NGL-22-009-013
PROJ: DA-2-0-061102-B-31-F

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS,
*IONOSPHERIC PROPAGATION), TURBULENCE, LASERS,
SIGNAL-TO-NOISE RATIO, RAYLEIGH SCATTERING,
ATTENUATION, MATHEMATICAL MODELS (U)
IDENTIFIERS: ATMOSPHERIC ATTENUATION (U)

THE PERFORMANCE OF OPTICAL COMMUNICATION LINKS OVER
ATMOSPHERIC CHANNELS IS SEVERELY LIMITED BECAUSE OF
THE EFFECTS OF TURBULENCE. ONE METHOD OF
RECOVERING SOME OF THE ATMOSPHERIC FADING LOSSES IS
TO MATCH THE INSTANTANEOUS SIGNALLING RATE TO THE
CHANNEL STATE. THE AUTHORS DEMONSTRATE THAT THE
DATA TRANSMITTER CAN EXTRACT REAL-TIME CHANNEL-STATE
INFORMATION BY PROCESSING THE FIELD RECEIVED WHEN A
PILOT TONE IS SENT FROM THE DATA RECEIVER TO THE DATA
TRANSMITTER. BASED ON THESE CHANNEL MEASUREMENTS,
THE AUTHORS DERIVE OPTIMAL VARIABLE-RATE TECHNIQUES,
AND SHOW THAT SIGNIFICANT IMPROVEMENTS IN SYSTEM
PERFORMANCE ARE OBTAINED, PARTICULARLY AT LOW BIT
ERROR RATES. (AUTHOR) (U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD*737 535 20/5
INFORMATICS TISCO INC RIVERDALE MD

BIBLIOGRAPHY OF SOVIET LASER
DEVELOPMENTS.

(U)

DESCRIPTIVE NOTE: INTERIM REPT. NO. 5, JUL-SEP 71,
DEC 71 95P HIBBEN, STUART G. I
CONTRACT: F44620-70-C-0081, ARPA ORDER-1622
PROJ: ARPA-0F10
MONITOR: AFOSR TR-72-0485

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO INTERIM REPT. NO. 4, AD-
732 244.

DESCRIPTORS: (*LASERS, USSR), (*BIBLIOGRAPHIES,
LASERS), GAS LASERS, IRASERS, SEMICONDUCTORS,
OPTICAL MATERIALS, OPTICAL EQUIPMENT COMPONENTS,
COHERENT RADIATION, RADIATION EFFECTS, LIGHT
COMMUNICATION SYSTEMS, DATA PROCESSING SYSTEMS,
STEREOSCOPIC PHOTOGRAPHY, RADIATION DAMAGE, PLASMA
GENERATORS

(U)

IDENTIFIERS: SOLID STATE LASERS, SEMICONDUCTOR
LASERS, LIQUID LASERS, CHEMICAL LASERS,
ULTRAVIOLET LASERS, NONLINEAR OPTICS, ORGANIC
DYE LASERS, LASER MATERIALS, QUANTUM ELECTRONICS,
HOLOGRAPHY

(U)

THE REPORT COVERS THE THIRD QUARTER OF 1971 WITH
THE MAJOR YIELD OF INFORMATION COMING FROM THE
APPROXIMATELY 30 PERIODICALS KNOWN TO REPORT THE MOST
ADVANCED AND INTERESTING FINDINGS IN SOVIET LASER
TECHNOLOGY. THIS AS WELL AS THE PREVIOUS FOUR
REPORTS COVERS THE FOLLOWING TOPICS: (1) LASER
RESEARCH -- SOLID STATE, LIQUID, GAS AND CHEMICAL
LASERS; UV; COMPONENTS; NONLINEAR OPTICS;
SPECTROSCOPY OF LASER MATERIALS; SHORT PULSE
GENERATION; CRYSTAL GROWING; AND GENERAL THEORY;
(2) LASER APPLICATIONS -- BIOLOGICAL EFFECTS,
COMMUNICATIONS, COMPUTER TECHNOLOGY, HOLOGRAPHY,
INSTRUMENTATION, MATERIALS PROCESSING, AND PLASMA
GENERATION. (AUTHOR)

(U)

UNCLASSIFIED

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. /ZLW13

AD-836 935 17/2 17/8 20/5 20/6
SYLVANIA ELECTRONIC SYSTEMS-EAST WALTHAM MASS APPLIED
RESEARCH LAB

ACQUISITION AND TRACKING LASER COMMUNICATIONS
SYSTEM.

(U)

DESCRIPTIVE NOTE: FINAL REPT. 1 JUL 66-30 APR 68,
JUL 68 137P LANG, K. PIKE, R. ;
RATCLIFFE, G. ;
REPT. NO. F-6170-1
CONTRACT: DA-28-043-AMC-02434(E)
PROJ: DA-1P-620501-A-448
TASK: 1-P-620501-A-44806
MONITOR: ECOM 02434-F

UNCLASSIFIED REPORT

DESCRIPTORS: (*LIGHT COMMUNICATION SYSTEMS, GAS
LASERS), DESIGN, MODEL TESTS, TARGET
ACQUISITION, OPTICAL TRACKING, MIRRORS,
REFLECTION, SWEEP GENERATORS,
RANGES(DISTANCE), ATMOSPHERIC REFRACTION,
ACCURACY, INSTRUCTION MANUALS, WIRING DIAGRAMS,
HELIUM, NEON, TELEPHOTO LENSES, FOCUSING,
CONTROL SYSTEMS, TRACKING TELESCOPES,
ELECTROOPTICS, PHOTOMULTIPLIERS
IDENTIFIERS: LASER COMMUNICATION SYSTEMS, BEAM-
STEERING, BREADBOARD MODELS, APERTURES

(U)

(U)

THREE DIFFERENT TECHNIQUES FOR AN ACQUISITION AND
TRACKING COMMUNICATIONS SYSTEM WERE EVALUATED, AND A
DESIGN PLAN WAS MADE FOR THE MOST PROMISING APPROACH.
IN ADDITION, A SERIES OF ATMOSPHERIC PROPAGATION
EXPERIMENTS WERE PERFORMED OVER A 1-KILOMETER
TURBULENT ATMOSPHERIC PATH TO DETERMINE OPTIMUM
BEAMWIDTHS AND RECEIVING APERTURE SIZES.
FURTHERMORE, STUDIES OF AN ELECTRO-MAGNETICALLY
OPERATED BEAM-STEERING MIRROR WERE MADE. IN THE
RECOMMENDED SYSTEM A MUTUALLY ALIGNED LASER
TRANSMITTER AND RECEIVER COMBINATION USING A COMMON
MIRROR STEERING ELEMENT IS USED TO ALWAYS POINT BOTH
RECEIVER AND TRANSMITTER ALONG THE SAME DIRECTION IN
SPACE. THE FOCAL PLANE OF THE OPTICS IS SCANNED TO
ACQUIRE AND SUBSEQUENTLY TRACK THE REFLECTED SIGNAL
FROM A RETROREFLECTOR MOUNTED ON THE REMOTE TERMINAL.
THE AUTOMATIC ACQUISITION AND SEARCH PHASE IS
ACCOMPLISHED BY MOVING THE MIRROR BEAM-STEERING
ELEMENT IN A RASTER SCAN. THE AUTOMATIC TRACKING
FUNCTION IS PERFORMED BY ELECTRONICALLY SCANNING THE
FOCAL PLANE OF THE OPTICS WITH AN IMAGE DISSECTOR (U)

UNCLASSIFIED

CORPORATE AUTHOR - MONITORING AGENCY

•ADVISORY GROUP FOR AERONAUTICAL
RESEARCH AND DEVELOPMENT PARIS
(FRANCE)

• • •
AGARD-CP-3

PROPAGATION FACTORS IN SPACE
COMMUNICATIONS.
AD-674 170

•AERONAUTICAL SYSTEMS DIV WRIGHT-
PATTERSON AFB OHIO

• • •
ASD-TDR62 733

STUDY AND INVESTIGATION OF
ACQUISITION AND TRACKING OF OPTICAL
COMMUNICATION SYSTEMS
AD-293 452

• • •
ASD-TDR62 727

EXPERIMENTAL VERIFICATION OF
SUN-POWERED LASER TRANSMITTER.
AD-420 983

•AEROSPACE CORP EL SEGUNDO CALIF LAB
OPERATIONS

• • •
TR-0198(923D-02)-1

DESIGN CONSIDERATIONS OF
MULTIPLE LASER COMMUNICATION LINKS
BETWEEN SYNCHRONOUS SATELLITE AND
SEVERAL EARTH STATIONS,
(SAMSQ-TR-68-7)
AD-673 876

•AEROSPACE RESEARCH LABS WRIGHT-
PATTERSON AFB OHIO

• • •
ARL-68-0033

DYNAMICS OF OPTICAL MIXING IN A
HE-NE LASER,
AD-669 086

• • •
ARL-70-0289W

FREQUENCY SHIFT AT 3.39 MICRONS
DUE TO COMPETITION BY 0328-A LASER
RADIATION,
AD-716 876

•AIR FORCE AVIONICS LAB WRIGHT-
PATTERSON AFB OHIO

• • •

AFAL-TDR-64-141

EFFECT OF OPTICAL PATH
IMPERFECTIONS ON FABRY-PEROT
MODULATOR PERFORMANCE.
AD-603 004

• • •

AFAL-TDR-64-181-P2

RESEARCH ON TECHNIQUES FOR
LIGHT MODULATION DETECTION; PART
II: FREQUENCY DEMODULATORS.
AD-605 512

• • •

AFAL-TDR-64-181-PT-1

RESEARCH OF TECHNIQUES FOR
LIGHT MODULATION DETECTION, PART
I, AMPLITUDE DEMODULATORS.
AD-605 478

• • •

AFAL-TDR-64-227

TUNING OF CW LASERS OVER
ANGSTROM BANDWIDTHS: SOME POSSIBLE
APPROACHES.
AD-607 852

•AIR FORCE CAMBRIDGE RESEARCH LABS L G
HANSCOM FIELD MASS

• • •

AFCRL-62 532

ON THE PRODUCTION OF AND
SCATTER PROPAGATION FROM ARTIFICIAL
IRREGULARITIES IN THE IONOSPHERIC D-
LAYER
AD-284 721

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AFCRL-64-914

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RADC-TDR64 130 AD-603 622	SB 62 7 AD-275 591
RADC-TDR-64-369 AD-612 725	SCIENTIFIC-4 AD-649 851
RADC-TR-66-704-VOL-1 AD-650 870	SEL-64-092 AD-607 852
RADC-TR-66-704-VOL-2 AD-650 871	SEL-TR-0576-6 AD-607 852
RADC-TR-66-704-VOL-3 AD-650 872	SH-279 AD-732 229

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SRDE-68009	TR-483
AD-682 079	AD-736 354
SRDE-70016	TR-Q41
AD-708 677	AD-628 546
SRDE-70064	TRC-BR-19398
AD-720 937	AD-708 677
TDR62 733	TRC-BR-23407
AD-292 452	AD-720 937
THEMIS-869-1	TRC-BR-23770
AD-692 623	AD-724 028
TN-1969-28	TRG-286-IR-1
AD-692 438	AD-658 175
TN-1971-43	TT 62 721
AD-731 535	AD-286 611
TPR-386	TT-65 60830
AD-617 717	AD-610 130
TR-5	TT-65-62953
AD-642 514	AD-621 053
TR-9	TT-66-60733
AD-721 372	AD-629 473
TR-14	TT-67-60193
AD-666 434	AD-612 606
TR-39	TT-67-62146
AD-659 738	AD-652 962
TR-111	TT-67-62867
AD-677 374	AD-658 782
TR-0158(9230-021-1	UZAL-67-9
AD-672 876	AD-646 424
TR-392	JNAIR-C-920083-12
AD-630 243	AD-605 940
TR-474	VI-52-1
AD-706 212	AD-724 046
TR-1	VI-52-2
AD-717 948	AD-724 047

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VI-92-3
AD-734 048

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Security Classification

1a. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
*Lasers *Light Communication Systems *Bibliographies *Laser Communication Systems Modulation Modulators Demodulators Communication Equipment Data Transmission Systems Light Transmission Gas Lasers Injection Lasers Q Switched Lasers Trasers Semiconductors Chemical Lasers Propagation USSR Laser Diodes Semiconductor Lasers Space Communication Systems						

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